



Budget Estimates

Fiscal Year 1992

Volume II

Construction of Facilities

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

The Construction of Facilities (CoF) appropriation provides contractual services for the repair, rehabilitation, and modification of existing facilities; the construction of new facilities and the acquisition of related facility equipment; environmental compliance activities; the design of facilities projects; and advanced planning related to future facilities needs.

The funds requested for FY 1992 provide for continuing prior year endeavors to meet facilities requirements for the Space Station Freedom and Space Flight Programs; construction of new facilities needed to support science, space technology, and aeronautical research; repair, rehabilitation, and modification of other facilities to maintain, upgrade, and improve the usefulness of the NASA physical plant; minor construction of new facilities, facility planning, and design activities; and environmental compliance and restoration.

The projects and amounts in the budget estimates reflect Space Station Freedom and Space Flight (including the Advanced Solid Rocket Motor Program) facilities requirements that are time-sensitive to meet specific program objectives. Other program requirements for 1992 include modernization of the industrial area chilled water system, rehabilitation, and expansion of the communications duct banks, and replacement of the 15 kilowatt load break switches at the Kennedy Space Center; repair of the site water system at the White Sands Test Facility; replacement of two central plant chillers and a boiler at the Johnson Space Center; completion of modifications to the X-Ray Calibration Facility in support of the Advanced X-Ray Astrophysics Facility (AXAF) at the Marshall Space Flight Center; restoration and modernization of the high voltage distribution system and construction of a data information system facility in support of the Earth Observing System (EOS) program at the Goddard Space Flight Center; modernization of the main electrical substation at the Jet Propulsion Laboratory; continuation of restoration of utilities at the Wallops Flight Facility; projects to repair, restore, and modernize NASA's aeronautical research and development facilities at Ames, Lewis, and Langley Research Centers; and construction of a data interface facility and rehabilitation of the Tracking and Data Relay Satellite System (TDRSS) ground terminal at the White Sands Test Facility in New Mexico.

The FY 1992 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensuring safe, economical, and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program begun in prior years and continues a responsive repair program. The repair program restores facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements. The environmental compliance and restoration program ensures that statutory environmental requirements are met and any necessary remedial actions are promptly taken.

Funds requested for facility planning and design cover advance planning and design requirements for potential future projects, master planning, facilities studies, engineering reports and studies and the preparation of facility project design drawings and bid specifications.

The budget authority requested for FY 1992 is \$480,300,000, with estimated outlays of \$444,949,000.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

CONSTRUCTION OF FA ———

For construction, repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and for facility planning and design *not otherwise* provided, for the National Aeronautics and Space Administration, and for the acquisition or condemnation of real property, as authorized by law [and, notwithstanding the limitations on the availability of funds appropriated under this heading by this appropriations Act an amount of \$10,000,000 appropriated hereunder k to remain available without fiscal year limitation and is appropriated for the operation and main-tenance of a new visitor center on the Lyndon B. Johnson Space Center to be constructed solely through the use of nonappropriated funds and for the provision of ancillary features such as roads, park-ing lots, utility services, and exhibits, and without regard to 31 U.S.C. 3302, such amount or portions thereof maybe invested in securities of the United States Government and the interest earned thereon may be retained and used for the aforesaid purposes, except that these appropriated funds and interest earned thereon shall not be used to construct the new visitor center building nor for the payment, direct- ly and indirectly, of principal or interest on any debt obligation incurred with respect to the new visitor center building, \$497,900,000] \$480,300,000, to remain available until September 30, 1994: Provided, That notwithstanding the limitation on the availabili-ty of funds appropriated under this heading by this appropriations Act, when any activity has been initiated by the incurrence of obliga-tions therefore the amount available for such activity shall remain available until expended, except that this provisions shall not apply to the amounts appropriated pursuant to the authorization for repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and design: Provided further, That no amount appropriated pursuant to this or any other Act may be used for the lease or construction of a new contractor-funded facility for exclusive use in support of a contract or contracts with the National Aeronautics and Space Administration under which the Administration would be required to substantially amortize through payment or reimbursement such contractor investment, unless an appropriations Act specifies the lease or con-tract pursuant to which such facilities are to be constructed or leased or such facility k otherwise identified in such Act Provided further, That the Administrator may authorize such facility lease or construction, if he determines, in consultation with the Committees on Appro-priations, that deferral of such action until the enactment of the next appropriations Act would be inconsistent with the interest of the Nation in aeronautical and space activities. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1991; additional authorizing legislation to be proposed.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION
(Thousands of Dollars)

L O C A T I O N -----	Fiscal Year 1990 -----	Fiscal Year 1991 -----	Fiscal Year 1992 Agency Request -----
Space Station Facilities.....	49,100	12,000	35,000
Space Flight Facilities.....	122,155	165,500	188,400
John F. Kennedy Space Center.....	10,288	---	6,700
Lyndon B. Johnson Space Center.....	2,760	11,000	7,000
George C. Marshall Space Flight Center.....	---	---	5,200
John C. Stennis Space Center... ..	---	3,800	---
Goddard Space Flight Center.....	16,370	16,600	24,000
Jet Propulsion Laboratory.....	5,320	27,200	5,500
Wallops Flight Facility.....	---	5,200	3,500
Aeronautical Facilities Revitalization.....	54,449	32,600	51,600
Ames Research Center.....	10,450	---	---
Hugh L. Dryden Flight Research Facility.....	---	12,800	---
Langley Research Center.....	6,800	4,600	---
Lewis Research Center.....	---	16,000	---
Various Locations.....	4,800	20,600	9,700
Repair	27,200	30,000	31,700
Rehabilitation and Modification.. ..	34,998	34,000	34,800
Minor	10,000	11,000	12,900
Deferred Rehabilitation and Major Maintenance	---	20,000	---
Facility Planning and Design... ..	26,300	28,000	34,000
Johnson Visitor Center.....	---	10,000	---
Classroom of the Future.....	---	4,000	---
Preliminary Planning for Consortium For International Earth Science Information Network Facilities.....	---	1,000	---
Environmental Compliance and Restoration.....	30,000	32,000	36,000
Proposed Davis-Bacon Act Reforms and Changes	---	---	(5,700)
 Total Plan.....	 410,990	 497,900	 480,300

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**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
SUMMARY OF THE BUDGET PLAN BY COGNIZANT OFFICE
(Thousands of Dollars)**

	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request
	-----	-----	-----
office of Space Flight	184,303	202,300	237,100
Office of Space Science and Applications	9,860	57,100	38,200
Office of Commercial Programs	2,200	3,000	---
Office of External Relations	---	4,000	---
Office of Aeronautics, Exploration and Space Technology	71,699	58,900	51,600
Office of Space Operations	14,430	17,600	9,700
Office of Management	128,498	155,000	149,400
Proposed Davis-Bacon Act Reforms and Changes	---	---	(5,700)
	-----	-----	-----
Total Plan	410,990	497,900	480,300
	=====	=====	=====

**SUMMARY OF THE BUDGET PLAN BY SUBFUNCTION
(Thousands of Dollars)**

Code				
253	Space Flight	171,255	177,500	223,400
254	Space Science, Applications and Technology	20,640	62,300	22,200
255	Supporting Space Activities	157,846	212,100	183,100
(250)	Subtotal, General Science, Space and Technology	(349,741)	(451,900)	(428,700)
402	Air Transportation	61,249	46,000	51,600
		-----	-----	-----
TOTAL		410,990	497,900	480,300
		=====	=====	=====

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
---	---	---	-----	-----	-----	-----	-----
			SPACE STATION FREEDOM FACILITIES AT VARIOUS LOCATIONS:	49,100	12,000	35,000	
			-----	-----	-----	
SF	1	253	Construction of space station process — Facility (KSC)	---	12,000	35,000	CF 1-1
SF	1	253	Construction of Addition for Space Systems Automated Integration and Assembly Facility (JSC)	8,350	---	---	
SF	1	253	Construction of Addition to Mission Control Center (JSC)	17,550	---	---	
SF	1	253	Construction of Addition to Simulator/Training Facility (JSC). ...	3,700	---	---	
SF	1	253	Construction of Orbital Debris Radar Facility (JSC)	13,650	---	---	
SF	1	253	Modifications for Expanded Solar Simulation (JSC)	1,950	---	---	
SF	1	253	Modifications of Process Technology Facility for Space Station (MSFC)	3,900	---	---	
			SPACE FLIGHT FACILITIES AT VARIOUS LOCATIONS:	122,155	165,500	188,400	
			-----	-----	-----	
SF	1	253	Modification for Earthquake Protection, Downey/Palmdale, CA (JSC). ...	---	---	4,400	CF 2-1
SF	1	253	Modifications for Safe Haven, Vehicle Assembly Building High-Bay 2 (KSC)	---	---	7,500	CF 2-5
SF	1	253	Rehabilitation of Crowl (KSC)	---	---	3,000	CF 2-8
SF	1	253	Restoration of Shuttle Facility shoulders (KSC)	---	---	4,000	CF 2-12
SF	1	253	Restoration of the High pressure Gas Facility (SSC)	---	---	6,500	CF 2-15
SF	1	253	Construction of Addition for Flight Training and Operations (JSC). ...	---	12,000	13,000	CF 2-19
SF	1	253	Rehabilitation of Mission Control Center Power and Control Systems (JSC)	---	8,500	---	
SF	1	253	Construct processing control center (KSC)	---	9,400	---	
SF	1	253	Construction of Transporter/Canister Facility (KSC)	---	5,500	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
---	---	---	-----	-----	-----	-----	-----
SPACE FLIGHT FACILITIES AT VARIOUS LOCATIONS (CONTINUED):							
SF	1	253	Replace Heating, Ventilating and Air Conditioning System Hypergolic Maintenance Facility (KSC)	---	2,100	---	
SF	1	253	Replace operations and Checkout Building West Cooling Tower (KSC) ...	---	1,000	---	
SF	1	253	Restoration of Heavy Equipment Area (KSC)	---	900	---	
SF	1	253	Upgrade Orbiter Processing Facility High Bay Heating Ventilating and Air-Conditioning System (KSC)	---	3,300	---	
SF	1	253	Upgrade Yundum International Airport to Full Transoceanic Abort Landing Site, Banjul, The Gambia (KSC)	---	3,400	---	
SF	1	253	Repair Condensate System, Main Manufacturing Building (MAF)	---	900	---	
SF	1	253	Construct Project Engineering Facility (MSFC)	---	17,000	---	
SF	1	253	Restoration of Information and Electronic Systems Laboratory (MSFC) ..	---	4,000	---	
SF	1	253	Rehabilitation of Hydrogen Transfer Facility (SSC)	---	2,700	---	
SF	1	253	Restoration of Space Shuttle Main Engine Test Complex "A" (SSC)	---	2,800	---	
SF	1	253	Construction of Advanced Solid Rocket Motor Program Facilities (Various Locations)	79,470	92,000	150,000	CF 2-23
SF	1	253	Replace Cooling Towers, Launch Complex 39 Utility Annex (KSC)	4,135	---	---	
SF	1	253	Replace Launch Complex 39, Pad A Chillers and Controls (KSC)	1,200	---	---	
SF	1	253	Replace Roofs, Launch Complex 39 (KSC)	10,700	---	---	
SF	1	253	Replace Vehicle Assembly Building Air Handling Units (KSC) ..	1,750	---	---	
SF	1	253	Upgrade Orbiter Modification and Refurbishment Facility to Orbiter Processing Facility #3 (KSC)	18,250	---	---	
SF	1	253	Modification of High pressure Industrial water System (SSC)	1,950	---	---	
SF	1	253	Replacement of High pressure Gas storage Vessels (SSC)	2,900	---	---	
SF	1	253	Construction of National Resource Protection (Various Locations)	1,800	---	---	

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CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
---	---	---	-----	-----	-----	-----	-----
			JOHN F. KENNEDY SPACE CENTER	10,288	---	6,700	
			-----	-----	-----	
SF	7	255	Modernization of Industrial Area Chilled water system.....	---	---	4,000	CF 3-1
SF	7	255	Rehabilitation and Expansion of Communications Duct Banks.....	---	---	1,400	a 3-5
SF	7	255	Replace 15 KV Load Break Switches... ..	---	---	1,300	a 3-9
SF	7	255	Increase Capacity of Kennedy Parkway	2,400	---	---	
SF	7	255	Refurbish Bridges, Merritt Island.	4,438	---	---	
SF	2	254	Rehabilitation of Spacecraft Assembly and Encapsulation Facility II..	3,450	---	---	
			LYNDON B. JOHNSON SPACE CENTER	2,760	11,000	7,000	
			-----	-----	-----	
SF	7	255	Repair Site Water System, White sands Test Facility	---	---	1,300	CF 4-1
SF	7	255	Replace Central Plant chillers and Boiler.....	---	---	5,700	a 4-4
SF	7	255	Construction of Addition to Site Electrical Substation	---	11,000	---	
SF	7	255	Rehabilitation of Central Heating/Cooling Plant.....	2,760	---	---	
			MARSHALL SPACE FLIGHT CENTER	---	---	5,200	
			-----	-----	-----	
SSA	2	254	Modifications to X-Ray & libration Facility (XRCF).	---	---	5,200	CF 5-1
			JOHN C. STENNIS SPACE CENTER	---	3,800	---	
			-----	-----	-----	
SF	7	255	Addition to Administration and Engineering Building	---	3,800	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
---	---	---	-----	-----	-----	-----	-----
			GODDARD SPACE FLIGHT CENTER	16,370	16,600	24,000	
			-----	-----	-----	-----	
SSA 7	255		Restoration and Modernization of High Voltage Distribution System...	---	---	7,000	CF 6-1
SSA 3	254		Construction of Earth Observing System Data Information System Facility..	---	8,000	17,000	CF 6-5
SSA 2	254		Construction of Detector Development Laboratory.....	---	3,100	---	
SSA 7	255		Replace Chillers, Central Heating/Refrigeration Plant.....	---	4,000	---	
SSA 7	255		Replacement/Modernization Electrical Power Feeders.....	---	1,500	---	
SO 7	255		Construction of Data Operations Facility.....	11,830	---	---	
SSA 2	254		Construction of Materials Quality Assurance Laboratory.....	4,540	---	---	
			JET PROPULSION LABORATORY	5,320	27,200	5,500	
			-----	-----	-----	-----	
SSA 7	255		Modernization of Main Electrical substation.....	---	---	5,500	CF 7-1
SSA 2	254		Construction of Observational Instruments Laboratory.....	---	14,000	---	
SSA 2	254		Refurbishment of 25-Foot Space Simulator.....	---	13,200	---	
SSA 2	255		Modernization of South utility Systems.....	5,320	---	---	
			WALLOPS FLIGHT FACILITY	---	5,200	3,500	
			-----	-----	-----	-----	
SSA 7	255		Restoration of utilities.....	---	5,200	3,500	a 8-1

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page Nb.
---	---	---	-----	-----	-----	-----	-----
-----CAL, FACILITIES REVITALIZATION AT VARIOUS LOCATIONS:				54,449	32,600	51,600	
.....				-----	-----	-----	
AET	5	402	w e of Outdoor Aerodynamic Research Facility (ARC)	---	---	3,300	a 9-1
AET	5	402	Modernization of 16-Foot Transonic Tunnel (LaRC)	---	---	3,400	CF 9-6
AET	5	402	Rehabilitation of Icing Research Tunnel (LeRC)	---	---	2,600	a 9-10
AET	5	402	Modifications to the High Pressure Air System (LaRC)	---	12,000	11,700	CF 9-14
AET	5	402	Modifications to Upgrade the 30X60-Foot Vind Tunnel (LaRC)	---	4,000	---	
AET	5	402	Repairs to the Tunnel Shell, Unitary Plan Vind Tunnel (LaRC)	---	2,700	---	
AET	5	402	Rehabilitation of Propulsion Systems Laboratory (LeRC)	---	6,000	---	
AET	5	402	Construction of 40x80 Drive Motor Roof (ARC)	1,000	---	---	
AET	5	402	Modifications to Thermo-Physics Facilities (ARC)	4,535	---	---	
AET	5	402	Repair and Modernization of the 12-Foot Pressure Wind Tunnel (ARC). ..	18,809	---	25,000	CF 9-18
AET	5	402	Modifications to 14X22 Subsonic Wind Tunnel (LaRC)	1,000	---	---	
AET	5	402	Modifications to National Transonic Facility for Productivity (LaRC). ..	7,010	---	---	
AET	5	402	Modifications to 20-Foot vertical Spin Tunnel (LaRC)	1,875	---	---	
AET	5	402	Rehabilitation of Central Air System (LeRC)	2,370	7,900	5,600	CF 9-23
AET	5	402	Rehabilitation of Central Refrigeration Equipment (LeRC)	7,100	---	---	
AET	5	402	Rehabilitation of 8X6 Supersonic and 9X15 Low-Speed Vind Tunnels (LeRC)	6,705	---	---	
AET	5	402	Rehabilitation of Hypersonic Tunnel (Plum Brook)....	4,045	---	---	
AMES RESEARCH CENTER				10,450	---	---	
.....				-----	-----	-----	
AET	4	254	Construction of Automation Sciences & search Facility	10,450	---	---	
DRYDEN FLIGHT RESEARCH FACILITY				---	12,800	---	
.....				-----	-----	-----	
AET	5	402	Construction of Liquid Hydrogen Structural Test Facility	---	8,800	---	
AET	7	255	Rehabilitation and Modification of the Electrical Distribution System	---	4,000	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
---	---	---	-----	-----	-----	-----	-----
			LANGLEY RESEARCH CENTER	6,800	4,600	---	
			-----	-----	-----	
AET	5	402	Construction of Addition for Light-Alloy Research Laboratory.....	---	4,600	---	
AET	5	402	Construction of Supersonic/Hypersonic Low Disturbance Tunnel.....	6,800	---	---	
			LEWIS RESEARCH CENTER	---	16,000	---	
			-----	-----	-----	
SSA	3	254	Construction of Space Experiments Laboratory.....	---	7,100	---	
AET	4	254	Refurbishment of Electric Power Laboratory.....	---	8,900	---	
			VARIOUS LOCATIONS	2,600	17,600	9,700	
			-----	-----	-----	-----	
SO	7	255	Construction of Rata Interface Facility, White Sands Test Facility, NM	---	---	4,000	CF 10-1
SO	7	255	Rehabilitation of Tracking and Data Relay Satellite System (TDRSS)				
			Ground Terminal, White Sands Test Facility, NM.....	---	---	5,700	CF 10-5
SO	7	255	Construction of 34-Meter Multifrequency Antenna, Goldstone, CA (JPL).	---	13,200	---	
SO	7	255	Rehabilitation of 70-Meter Antenna Drive Gear Boxes in Australia,				
			Spain, and Goldstone, CA (JPL)	---	4,400	---	
SO	7	255	Modifications for Seismic Safety, Goldstone, CA (JPL)	2,600	---	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

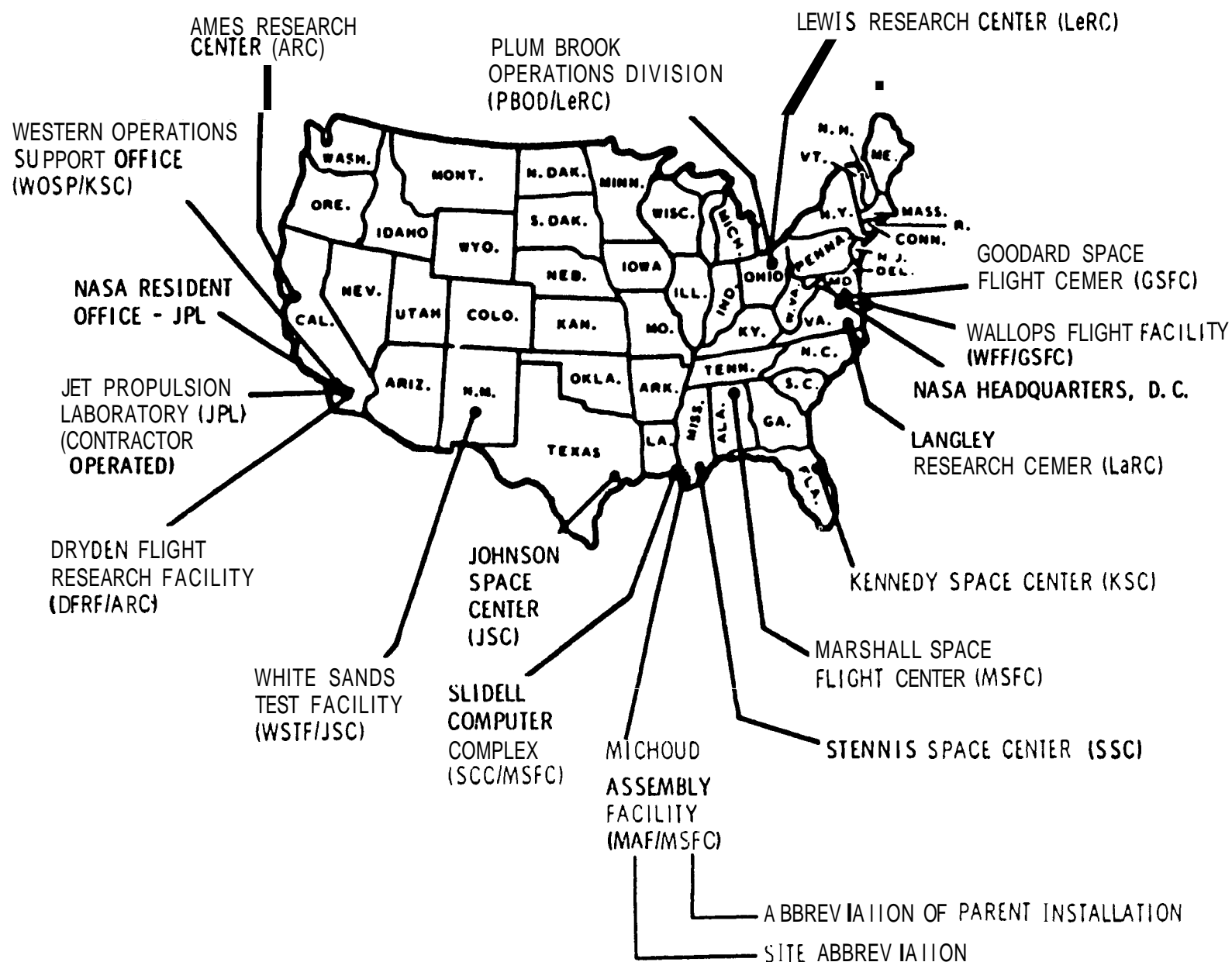
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(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1990	Fiscal Year 1991	Fiscal Year 1992 Agency Request	Page No.
MGT	7	255	REPAIR OF FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF \$1,000,000 PER PROJECT	27,200	30,000	31,700	CF 11-1
MGT	7	255	REHABILITATION AND MODIFICATION OF FACILITIES AT VARIOUS LOCATIONS NOT IN EXCESS OF \$1,000,000 PER PROJECT	34,998	34,000	34,800	CF 12-1
MGT	7	255	MINOR CONSTRUCTION OF NEW FACILITIES AND ADDITIONS TO EXISTING FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF \$750,000 PER PROJECT	10,000	11,000	12,900	CF 13-1
MGT	7	255	DEFERRED REHABILITATION AND MAJOR MAINTENANCE... ..	---	20,000	---	
MGT	7	255	FACILITY PLANNING AND DESIGN	26,300	28,000	34,000	CF 14-1
CP	3	254	WAKE SHIELD FACILITY	2,200	3,000	---	
SF	7	255	JOHNSON VISITOR CENTER	---	10,000	---	
ER	3	254	CLASSROOM OF THE FUTURE	---	4,000	---	
SSA	3	254	PRELIMINARY PLANNING FOR CONSORTIUM FOR INTERNATIONAL EARTH SCIENCE INFORMATION NETWORK FACILITIES.....	---	1,000	---	
			S U B T O T A L : CONSTRUCTION.....	380,990	465,900	450,000	
MGT	7	255	ENVIRONMENTAL COMPLIANCE AND RESTORATION PROGRAM	30,000	32,000	36,000	CF 15-1
			PROPOSED DAVIS-BACON ACT REFORMS AND CHANGES.. ..	---	---	(5,700)	
			T O T A L , CONSTRUCTION OF FACILITIES	410,990	497,900	480,300	

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LOCATION OF MAJOR AND COMPONENT INSTALLATIONS



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REPORTING INSTALLATION	LAND	BUILDING	OTHER STRUCTURES AND FACILITIES	LEASEHOLD IMPROVEMENTS	SUBTOTAL	EQUIPMENT	FIXED ASSETS IN PROCESS	OTHER
AMES RESEARCH CENTER	2929	497880	33630	0	534491	308929	138830	1069190
AMES HOFFERT FIELD, CA.	2928	472213	15351	0	499493	293672	127390	911553
ORVYDEN FLIGHT RESEARCH FACILITY EDWARDS, CA.	8	249771	17992	0	42992	81240	24440	150303
VARIOUS LOCATIONS (a)	1	696	347	0	1041	6017	8	7061
GOODARD SPACE FLIGHT CENTER	2080	206195	122655	0	391731	462893	59421	831354
CSFC - GREENBELT, MD.	1361	130290	20119	0	151771	246765	30779	437314
TRACKING STATIONS NETWORK	5	29154	24761	0	53921	95426	14061	164207
WFF - WALLONS ISLAND, VA.	1514	46561	73999	8	122073	56953	5701	104020
VARIOUS LOCATIONS (a)	0	190	3776	8	3961	61047	8	65013
JET PRODUCTION LABORATORY	1188	125531	112165	1095	239971	421329	120360	709676
DEEP SPACE NETWORK	1180	113892	230676	1095	130661	345362	120360	612301
8	12239	WCM	0	0	101324	75967	8	177295
JOHNSON SPACE CENTER	10944	245112	80102	105	344343	511490	209680	888869
JSC - HOUSTON, TX.	7374	203106	56489	0	266945	352192	28968	640129
WHITE SANDS TEST FACILITY LAS CRUCES, NM.	0	11765	2212	105	37992	25675	0	63667
VARIOUS LOCATIONS (a)	3570	30241	3571	1	39302	137631	8	El8111
KENNEDY SPACE CENTER	71345	573390	514922	1	1159657	814215	43665	2017537
KSC - CAPE CANAVERAL, FL.	71345	573390	514922	0	1159657	86587	43665	1289909
VARIOUS LOCATIONS (a)	0	0	0	0	1	12270	0	12270
LANGLEY RESEARCH CENTER	156	200777	401795	0	610728	242267	24094	877089
LARC - HAMPTON, VA.	108111	401795	401795	0	610728	226878	24094	862500
VARIOUS LOCATIONS (a)	0	0	0	0	0	15309	8	15309
LEWIS RESEARCH CENTER	2821	245394	92651	136	340002	210096	85503	637201
LERC - CLEVELAND, OH.	516	168987	73509	136	243028	115633	85503	445114
PLUM BROOK, SANDUSKY, OH.	2305	76407	19062	0	97774	79693	8	177467
VARIOUS LOCATIONS (a)	0	0	0	0	0	14700	8	14700
MARSHALL SPACE FLIGHT CENTER	7171	311208	176005	0	494464	563179	13095	1071530
MSFC - HUNTSVILLE, AL.	0	141631	79147	0	220778	349421	13095	570094
MICHAUD ASSEMBLY FACILITY, AL.	7102	159376	83666	0	256644	70918	13095	321262
VARIOUS LOCATIONS (a)	0	4028	10317	0	13145	139843	8	154908
STENNIS SPACE CENTER	10061	109043	224901	0	352005	35492	8	307497
STENNIS SPACE CENTER	18061	109043	224901	0	352005	35492	8	307497
VARIOUS LOCATIONS (a)	0	0	0	0	0	0	0	8
WASA HEADQUARTERS	0	0	0	0	0	35064	8	55064
WASA - HDS, WASH., D.C.	0	0	0	0	0	20934	0	20934
VARIOUS LOCATIONS (a)	0	0	0	0	0	24130	8	24130
AGENCY TOTAL	117295	2528219	1566906	1336	4400147	3697072	530624	8643043

PROJECT
JUSTIFICATION
BY LOCATION

1

SPACE STATION
FREEDOM FACILITIES

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

SUMMARY

SPACE STATION FREEDOM FACILITIES

	Amount ----- (Dollars)	Page No. -----
Office of Space Flight: -----		
Construction of Space Station Processing Facility, Kennedy Space Center.....	35,000,000	CF 1-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Construction of Space Station Processing Facility (SSPF)

INSTALLATION: John F. Kennedy Space Center

FY92 CoF Estimate: \$35,000,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$4,837,539	\$12,000,000	\$16,837,539
Capitalized Investment....	---	---	---
Total.....	<u>\$4,837,539</u>	<u>\$12,000,000</u>	<u>\$16,837,539</u>

SUMMARY PURPOSE AND SCOPE:

This project provides the second increment of funding for the Space Station Processing Facility (SSPF) for the prelaunch and post-landing nonhazardous processing of the various Space Station program elements. This increment will complete the facility structure, the high bay, intermediate bay, crane procurement, and test control and monitoring areas. Construction will continue on site utilities, cafeteria, mechanical and electrical distribution systems, tie-ins and checkouts, laboratories and architectural details. A follow-on increment in FY 1993 will be required to complete the facility.

PROJECT JUSTIFICATION:

Prelaunch processing is required to accomplish post shipment inspection and verification of Space Station Freedom elements; ensure elements are properly configured for launch; verify element interfaces; perform final prelaunch servicing; and verify, to the extent practicable, the capability of the elements and systems to function in orbit. Space Station Freedom elements will be in orbit for extended periods and cannot be easily or inexpensively returned to Earth for correction of system problems or malfunctions. Ground processing of Space Station elements, therefore, is critical to achieving the program objectives. The need for processing will continue during the operational phase of the Space Station, as certain elements will be regularly returned from orbit for refurbishment, retrofitting, and resupply, such as the U.S. and international logistic modules.

IMPACT OF DELAY:

Space Station Freedom processing activities will be "first time" events of this type which have historically resisted timeline compression. Delay of this project will result in subsequent slippage of Space Station Freedom operations and launch schedules.

PROJECT DESCRIPTION:

The completed SSPF will enclose a total gross area of approximately 456,000 square feet and house a permanent staff of over 1300 civil service, contractor, and user personnel. Highly specialized areas will include approximately 63,000 square feet of high bay and intermediate bay floor space for parallel processing of eight Space Station elements in a class 100K clean, controlled environment. Two facility overhead cranes (30-ton, 50-foot maximum hook height) will be provided in the high bay. A 4,200-square-foot airlock (100K clean) will provide high bay access. One 15 ton bridge crane with 45 foot hook height will span the width of the airlock. The processing areas will be provided with compressed air and vacuum systems, gaseous storage and distribution systems, (nitrogen and helium) gaseous vent system for ammonia, and an ultraviolet/infrared fire detection system. Chilled water serving the mechanical utility (HVAC) system will be sited in a separate structure to permit maximum utilization of existing chilled water sources in the industrial area. This will allow shared redundancy for the SSPF with existing systems. Revisions to this project description from that of last year is a result of completion of final design.

This second increment of funding will complete the facility structure, the high bay, intermediate bay, crane procurement and test control and monitoring areas. Construction will continue on the site utilities, cafeteria, the outfitting of the facility mechanical equipment and electrical distribution systems, tie-ins and checkouts, laboratories and architectural details.

PROJECT COST ESTIMATE: Based on final design.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$35,000,000</u>
Architectural/Structural	SF	456,000	\$37.09	16,911,000
Sitework	LS	---	---	3,319,000
Mechanical.. ..	SF	456,000	\$18.85	8,596,000
Electrical.....	SF	456,000	\$ 6.76	3,082,000
Cranes.....	LS	---	---	3,092,000
Total.....				<u>\$35,000,000</u>

The initial increment in FY 1991 was estimated at \$25,000,000 but was reduced to \$12,000,000. A third increment for \$42,500,000 is planned for FY 1993. The total estimated cost of this project is \$89,500,000.

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan Figure 2 - Site Plan Figure 3 - Perspective

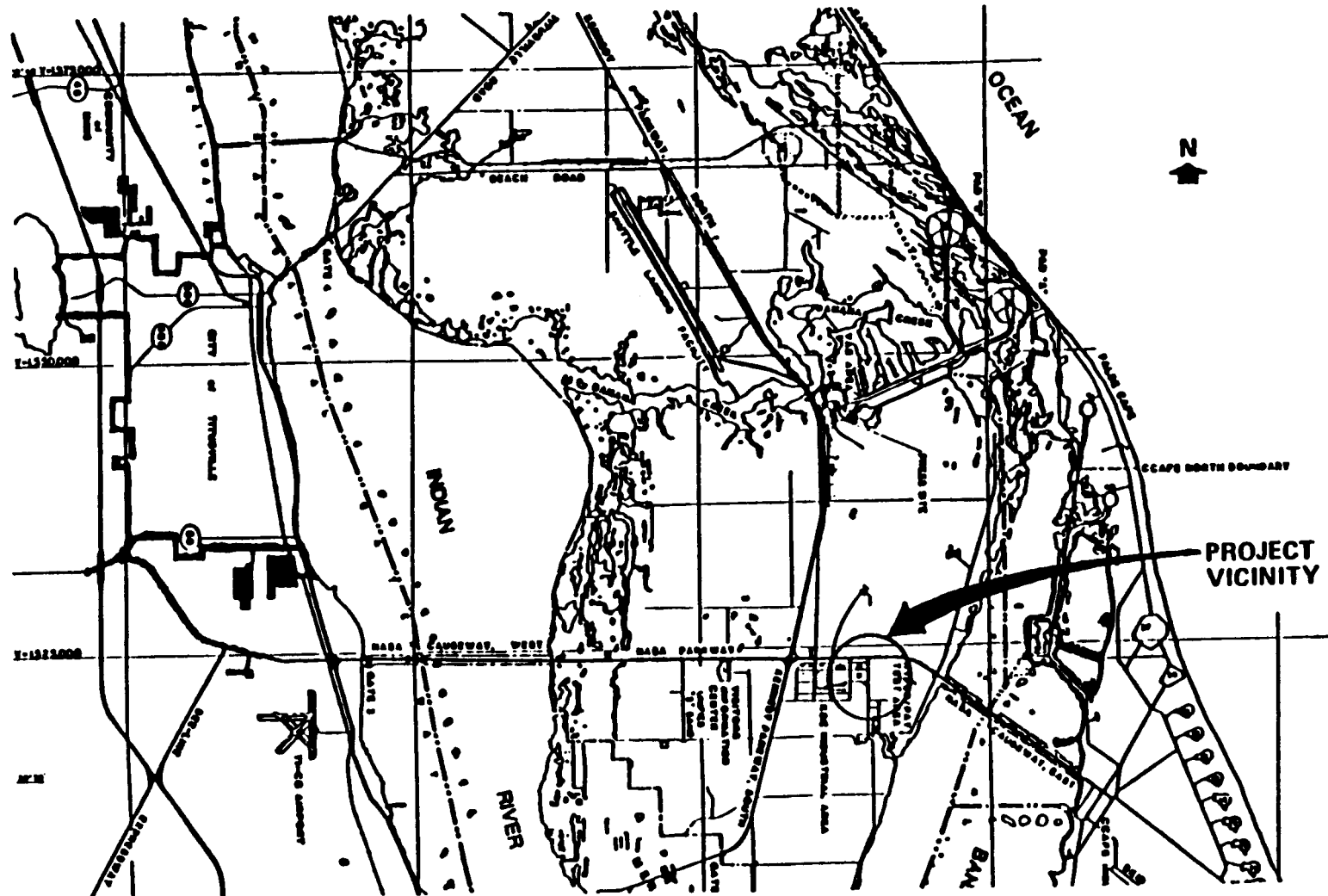
OTHER MEN SUMMARY

t noncollateral equipment to be l from l an Development resour and estimated to co
 f y \$350 ill will be d t support initial SSPF of

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

To complete this project, a third increment of approximately \$42.5 million will be required in FY 1993.

LOCATION PLAN



CF 1-4

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

SITE PLAN
KSC INDUSTRIAL AREA

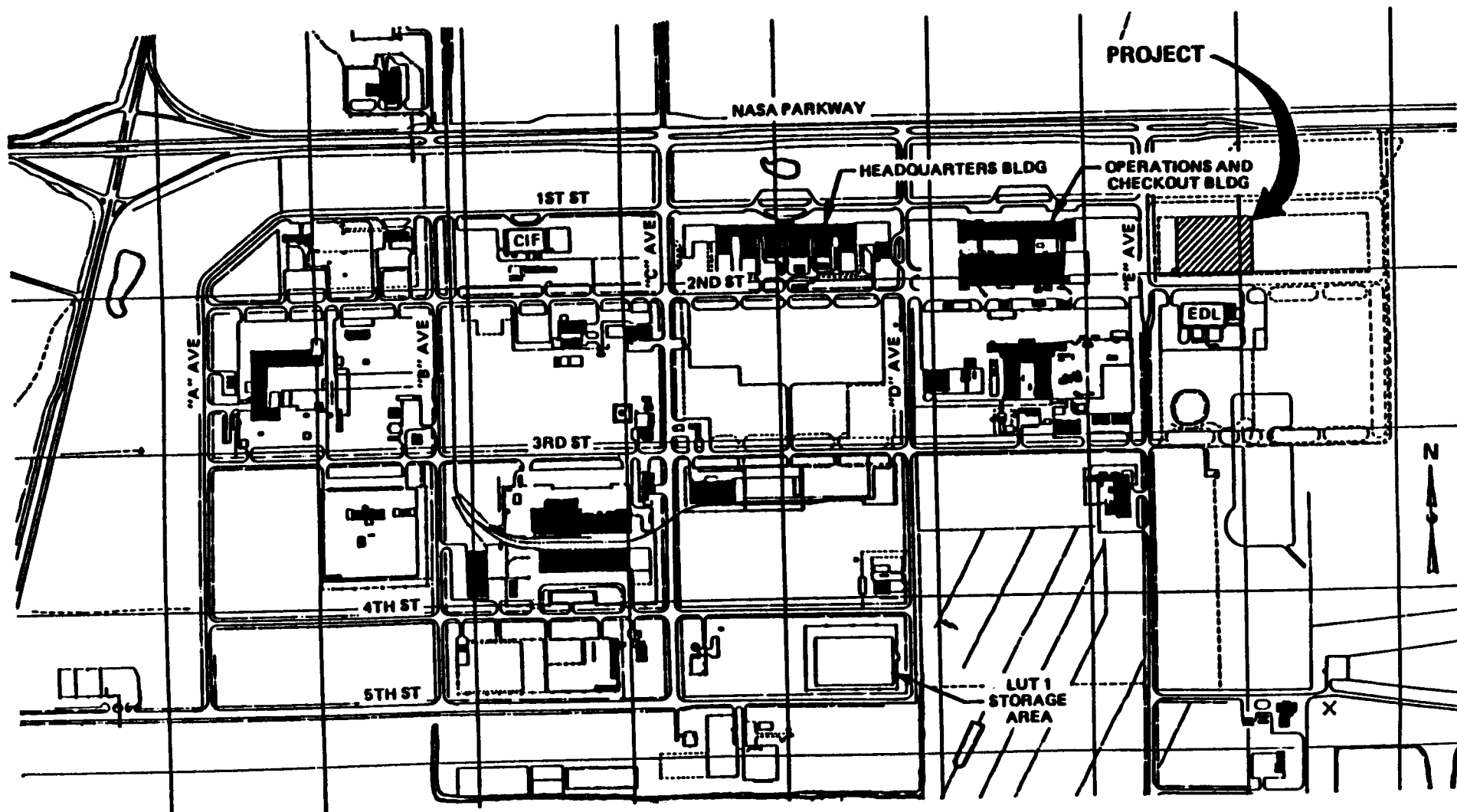


FIGURE 2

CF 1-5

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

PERSPECTIVE

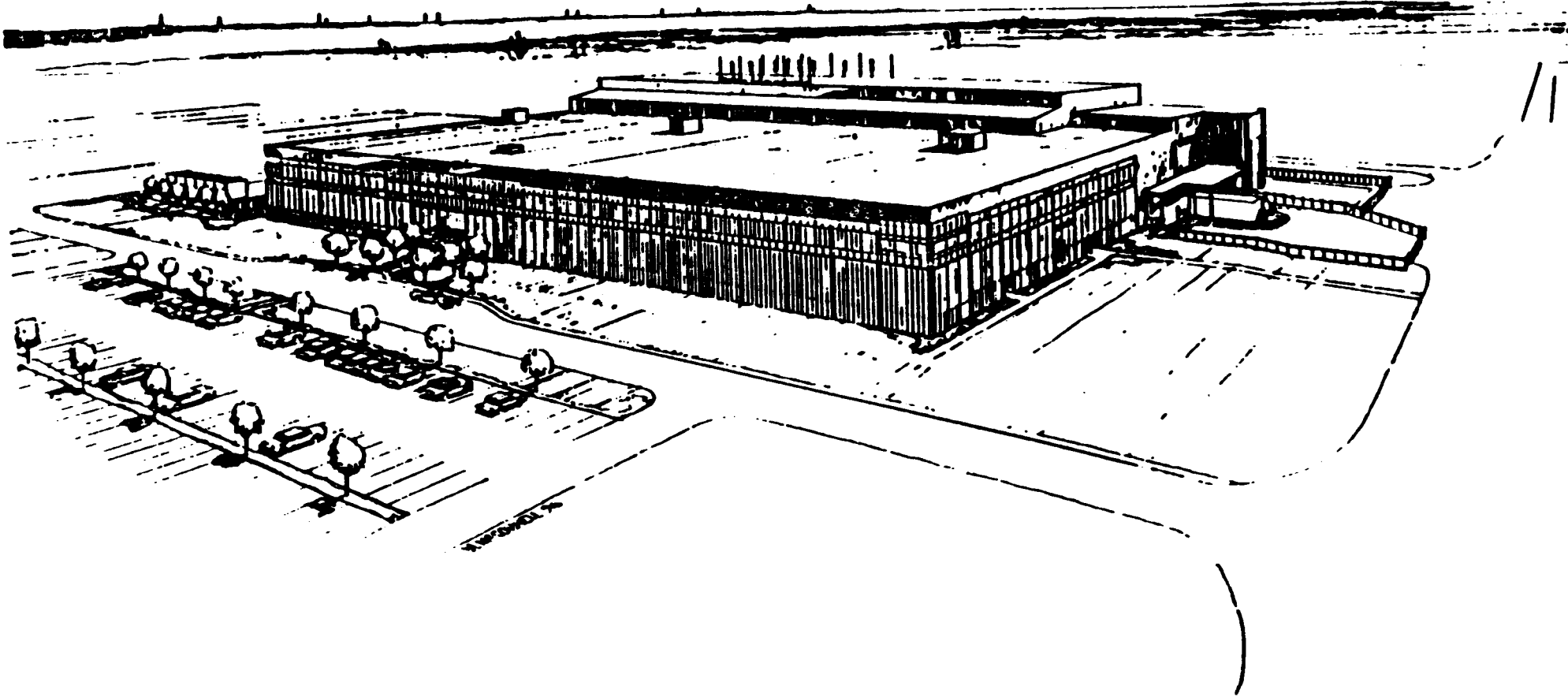


FIGURE 3

OTHER
SPACE FLIGHT
FACILITIES



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

SPACE FLIGHT FACILITIES

	Amount ----- (Dollars)	Page Nb. -----
Office of space Flight:		
Modification for Earthquake Protection, Downey/Palmdale, CA, Johnson Space Center	4,400,000	a 2-1
Modifications for Safe Haven , Vehicle Assembly Building High-Bay 2, Kennedy Space center	7,500,000	CF 2-5
Rehabilitation of Crawlerway, Kennedy Space Center	3,000,000	a 2-a
Restoration of Shuttle Landing Facility Shoulders, Kennedy Space Center	4,000,000	a 2-12
Restoration of the High Pressure Gas Facility, Stennis Space Center	6,500,000	CF 2-15
Construction of Addition for Flight Training and Operations Johnson Space Center	13,000,000	CF 2-19
Construction of Advanced Solid Rocket Motor Program Facilities, Various Locations..	150,000,000	a 2-23

Total..	188,400,000 =====	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modifications for Earthquake Protection, Downey/Palmdale, CA

INSTALLATION: NASA Industrial Plant, Downey, CA/Air Force Plant 42, Palmdale, CA

FY 1992 CoF Estimate: \$4,400,000

LOCATION OF PROJECT: Downey and Palmdale, Los Angeles County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$465,000	---	8 465,000
Capitalized Investment.....	---	\$ 30,740,422	30,740,442
Total.....	<u>\$465,000</u>	<u>\$30,740,442</u>	<u>\$31,205,442</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for strengthening the existing structural systems of key manufacturing buildings at the NASA Industrial Plant, Downey, CA and at Air Force Plant 42, Palmdale, CA. These facilities will be strengthened **so** that they comply with current earthquake design standards in the Los Angeles, California metropolitan area.

PROJECT JUSTIFICATION:

At Downey, minor earthquakes in the recent past have demonstrated significant weaknesses in the building structural systems. Life safety considerations dictate that NASA personnel be protected to a level which will allow them to be able to exit the building safely during an earthquake. This project will significantly increase the safety of personnel at Downey and bring the facilities up to the current earthquake design requirements for the Los Angeles metropolitan area. Additionally, this project will increase the safety of orbiter flight hardware and manufacturing tooling while significantly reducing the amount of orbiter manufacturing downtime should another earthquake occur.

The Downey and Palmdale buildings were constructed between 1929 and 1965 and are vulnerable to earthquake events because their original designs were to outdated codes, as was demonstrated by the 1987 Whittier earthquake when structural members at NASA's Downey plant buckled at relatively low seismic loadings. Their precast concrete construction and roof diaphragms do not provide seismic load paths and are subject to failure. In addition, the combination of additional mechanical and electrical equipment; installation of drop ceilings and light fixtures; and reroofing has, over the years, gradually increased the dead loads on roofs and structural systems; thereby reducing structural capacity of these buildings to withstand earthquakes.

IMPACT OF DELAY:

The NASA Industrial Plant at Downey and Air Force Plant 42, Orbiter Final Assembly Facilities at Palmdale will continue to be unable to withstand a low level earthquake, thus placing NASA personnel, orbiter-unique manufacturing tooling, and flight hardware at an unacceptably high risk of injury or damage.

PROJECT DESCRIPTION:

Modifications include strengthening column to beam connections, column to footing connections, roof diaphragms, and secondary structural bracing. Additional strengthening will be provided for numerous non-structural building elements such as light fixtures and overhead mounted equipment which also represent a danger to personnel during an earthquake. At Downey modifications will be made to buildings 1, 6, 41, 287, 288, and 189 while at Palmdale modifications will be made to buildings 150, 153, 163, 164, 165, and 192.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction.....</u>	---	---	---	<u>\$4,400,000</u>
Column to Beam Connections.....	LS	---	---	1,546,000
Column to Footing Connections.....	LS	---	---	1,370,000
Roof Diaphragm/Secondary Bracing.....	LS	---	---	879,000
Non-Structural Overhead Appurtenances.....	LS	---	---	605,000
 Total.....				 <u>\$4,400,000</u>

LIST OF RELATED GRAPHICS: Site Location Plans (2)

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional funds may be required to fully comply with earthquake codes as they become more stringent or risk levels increase.

**LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
MODIFICATIONS FOR EARTHQUAKE PROTECTION, NLP, DOWNEY, CA**

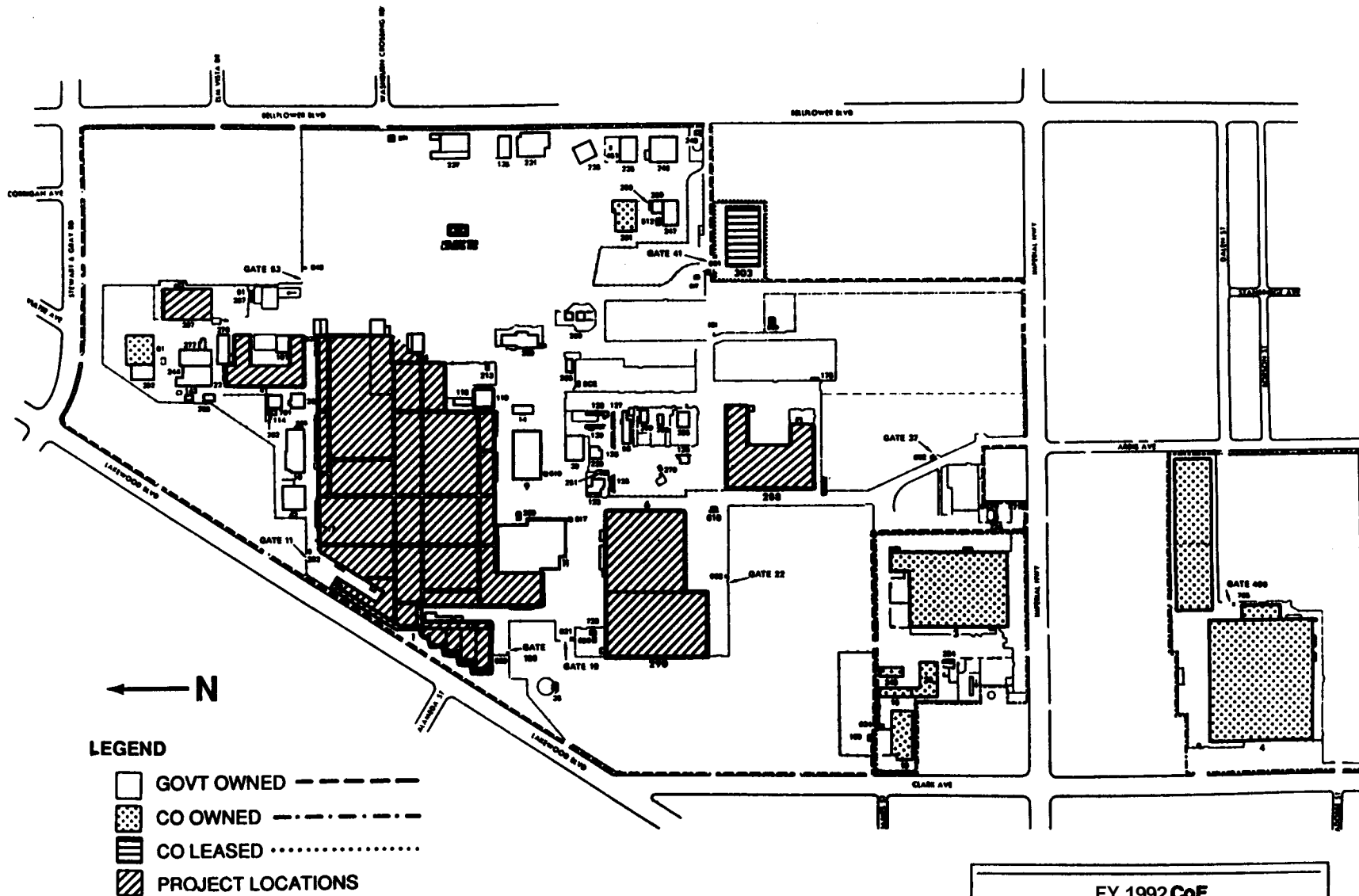
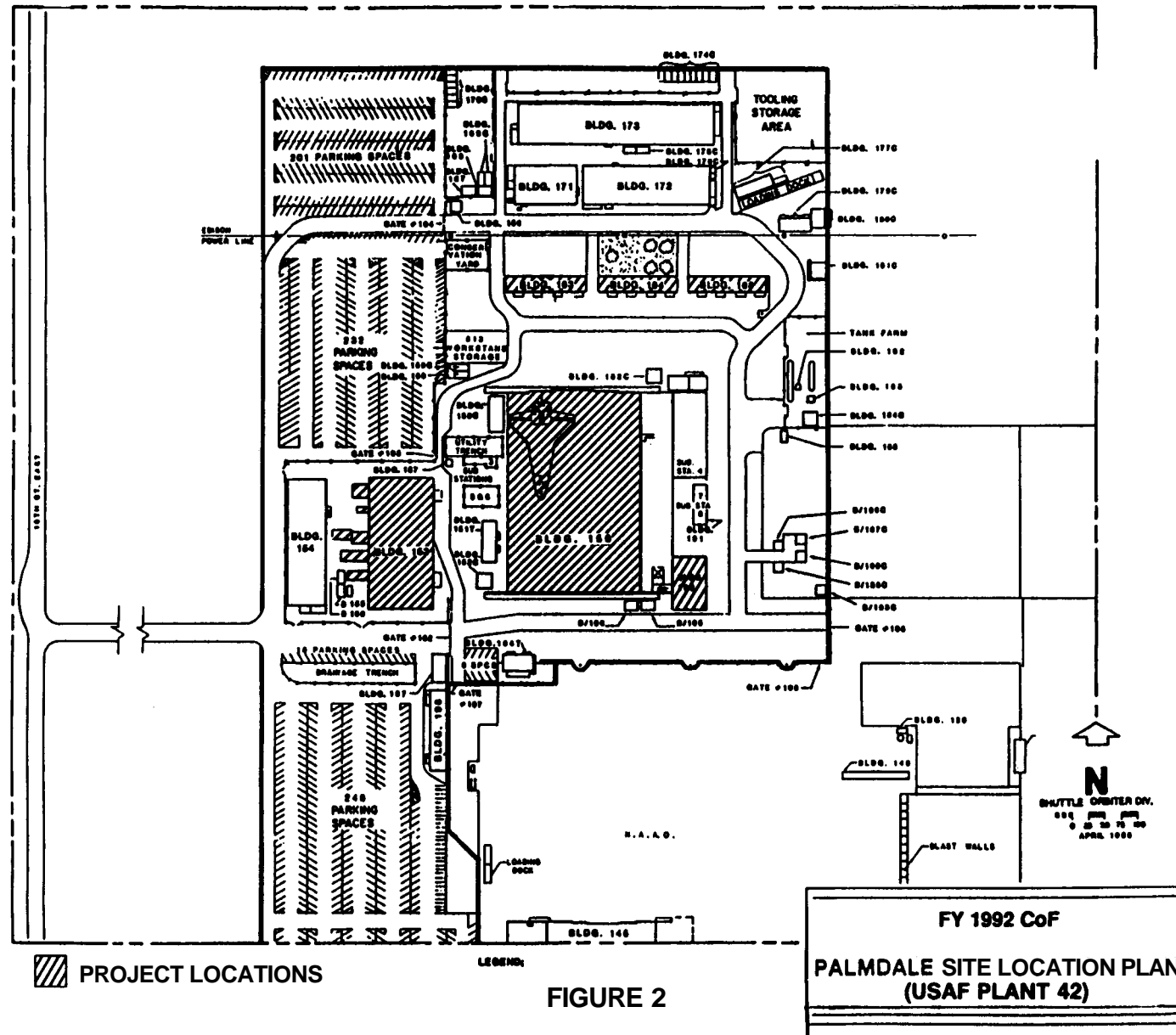


FIGURE 1

**FY 1992 CoF
SITE LOCATION PLAN**

**LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
MODIFICATIONS FOR EARTHQUAKE PROTECTION, DOWNEY/PALMDALE, CA**



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications for Safe Haven, Vehicle Assembly Building High-Bay 2

INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: \$7,500,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Desim</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$550,000	---	\$ 550,000
Capitalized Investment.....	---	<u>\$169,886,865</u>	<u>169,886,865</u>
Total.....	<u>\$550,000</u>	<u>3169,886,865</u>	<u>\$170,436,865</u>

SUMMARY PURPOSE AND SCOPE:

This project will provide a safe haven (hurricane protection) for a fully stacked mobile launcher in High Bay 2 of the Vehicle Assembly Building (VAB). It will allow the return of a stacked launcher from the launch pad in the event of a hurricane when High Bays 1 and 3 are occupied with partially stacked mobile launchers.

PROJECT JUSTIFICATION:

This project is required to provide access to High Bay 2 for a fully stacked Mobile Launch Platform during the hurricane season, which is from May through November of each year. The west side of the VAB (High Bays 2 and 4) is not currently accessible to a Mobile Launch Platform because temporary housing, cross country power lines, railroad tracks, etc. are existing in the crawlerway. A Shuttle stacked on a Mobile Launch Platform and left out during a hurricane is subject to severe damage. The only present option is to destack any flight hardware which might be in High Bays 1 or 3 to make room before arrival of the storm. Hurricane Hugo in September 1989 presented considerable risk to STS-34 on LC-39 Pad B because High-Bays 1 and 3 contained Mobile

Launch Platforms stacked with flight hardware for **STS-32** and **STS-33**. The probability of needing a safe haven will greatly increase beginning in December 1990 when Pad A becomes available, along with the expected increase in flight schedules making it possible that Shuttles could be at both pads with a stacked Mobile Launch Platform in the VAB.

IMPACT OF DELAY:

Failure to implement this project will increase the possibility of damage to an orbiter on a fully stacked Mobile Launch Platform during a hurricane.

PROJECT DESCRIPTION:

This project will clear an abandoned section of the crawlerway from the transporter park site to High Bay 2. The abandoned section will then be reconstructed consisting of a compacted aggregate base course and a compacted subbase. The Orbiter Processing Facility Modular Housing will be moved away from the crawlerway. The utilities serving the Orbiter Maintenance and Refurbishment Facility will be modified by encasement in concrete. Other items such as the lift station, manholes, power substations and chilled water lines will be relocated. A portion of the parking lot on the east side of Utility Road will be demolished and the Orbiter Processing Facility parking lot will be relocated. Work in High Bay 2 will consist of the removal of a 125-ton hoist and relocation of two pedestals for the Mobile Launch Platform from High Bay 4 to High Bay 2, including modification of the foundations. Access to the Mobile Launch Platform via Tower A and power to a fire detection system will also be provided.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>cost</u>
<u>Construction.....</u>	---	---	---	<u>\$7,500,000</u>
Relocate Duct Bank/Piping.....	LS	---	---	3,250,000
Relocate Building	LS	---	---	1,625,000
Restore Crawlerway	LS	---	---	1,625,000
Parking Area and Misc.....	LS	---	---	366,000
Pedestal.....	LS	---	---	407,000
Cranes and Other.....	LS	---	---	227,000
Total... ..				<u>\$7,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
MODIFICATIONS FOR SAFE HAVEN, VEHICLE ASSEMBLY BUILDING HIGH-BAY 2**

SITE PLAN

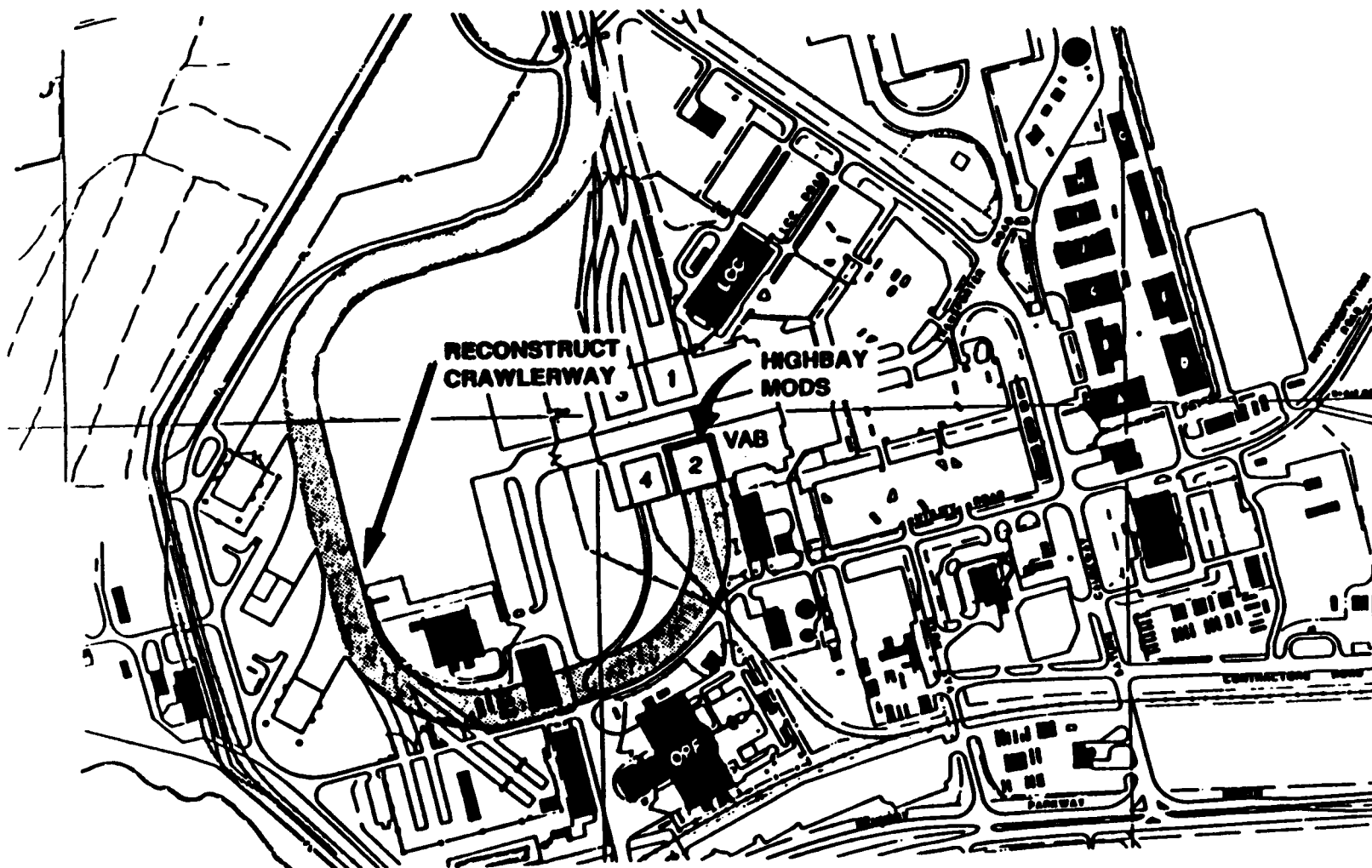


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation of Crawlerway

INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: \$3,000,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project.

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$240,000	---	\$ 240,000
Capitalized Investment.....	---	\$5,668,419	5,668,419
Total.....	<u>\$240,000</u>	<u>\$5,668,419</u>	<u>\$5,908,419</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for rehabilitation of designated sections of the crawlerway between the Vehicle Assembly Building and Launch Pads A and B. The surface and base course of the crawlerway will be brought back to specification so that proper support will be provided for a fully loaded Shuttle crawler transporter.

PROJECT JUSTIFICATION:

Testing of the present base course and surface course of the crawlerway indicates unsatisfactory bed integrity. Straightaway sections between the Vehicle Assembly Building and Pad A/B fork have settled, resulting in premature failure of the crawlerway surface. The crushing of surface aggregate into small aggregate and sand by the transporter tracks obstructs rain water drainage and causes ponding of water on the crawlerway surface, followed by additional water infiltration into the base course. Intrusion of fine sand particles during wet conditions also causes damage to crawler transporter tracks.

IMPACT OF DELAY:

If this project is not approved, there would be increased risk of premature failure of the crawler transporter tracks and the crawlerway surface. The consequence would be an inability to move the Space Shuttles to the launch pads.

PROJECT DESCRIPTION:

This project provides for restoration of the curve areas between the Vehicle Assembly Building area and Pad B and from crawler parksite north toward Pad B. Existing rock will be removed and the base and sealing courses will be restored. Eight inches of new rock will be installed to bring the surface back to specification. Also included is the construction of a permanent railroad siding with bulkhandling and storage facility for off-loading the large quantity of rock and gravel required for this and follow-on projects.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>Unit cost</u>
<u>Construction</u>	---	---	---	<u>\$3,000,000</u>
Rehabilitate Crawlerway	LS	---	---	3,000,000
Total.....				<u>\$3,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Site Layout

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

Approximately \$2,000,000 to \$3,000,000 will be required to rehabilitate other sections of the crawlerway in subsequent years.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF CRAWLERWAY

SITE PLAN
VAB AREA

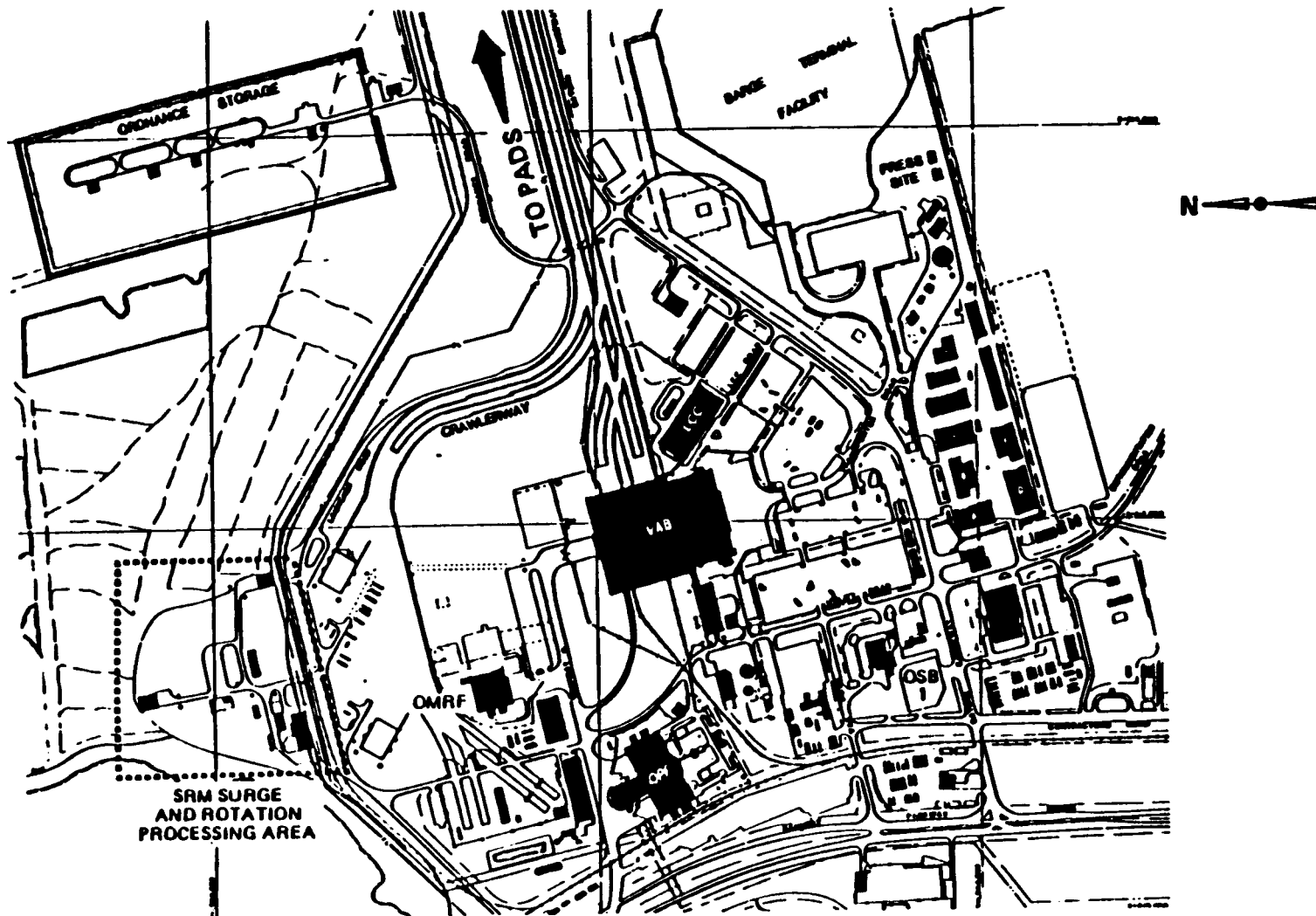


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF CRAWLERWAY

SITE LAYOUT

PROJECTS LEGEND

— FY 92
- - FY 93

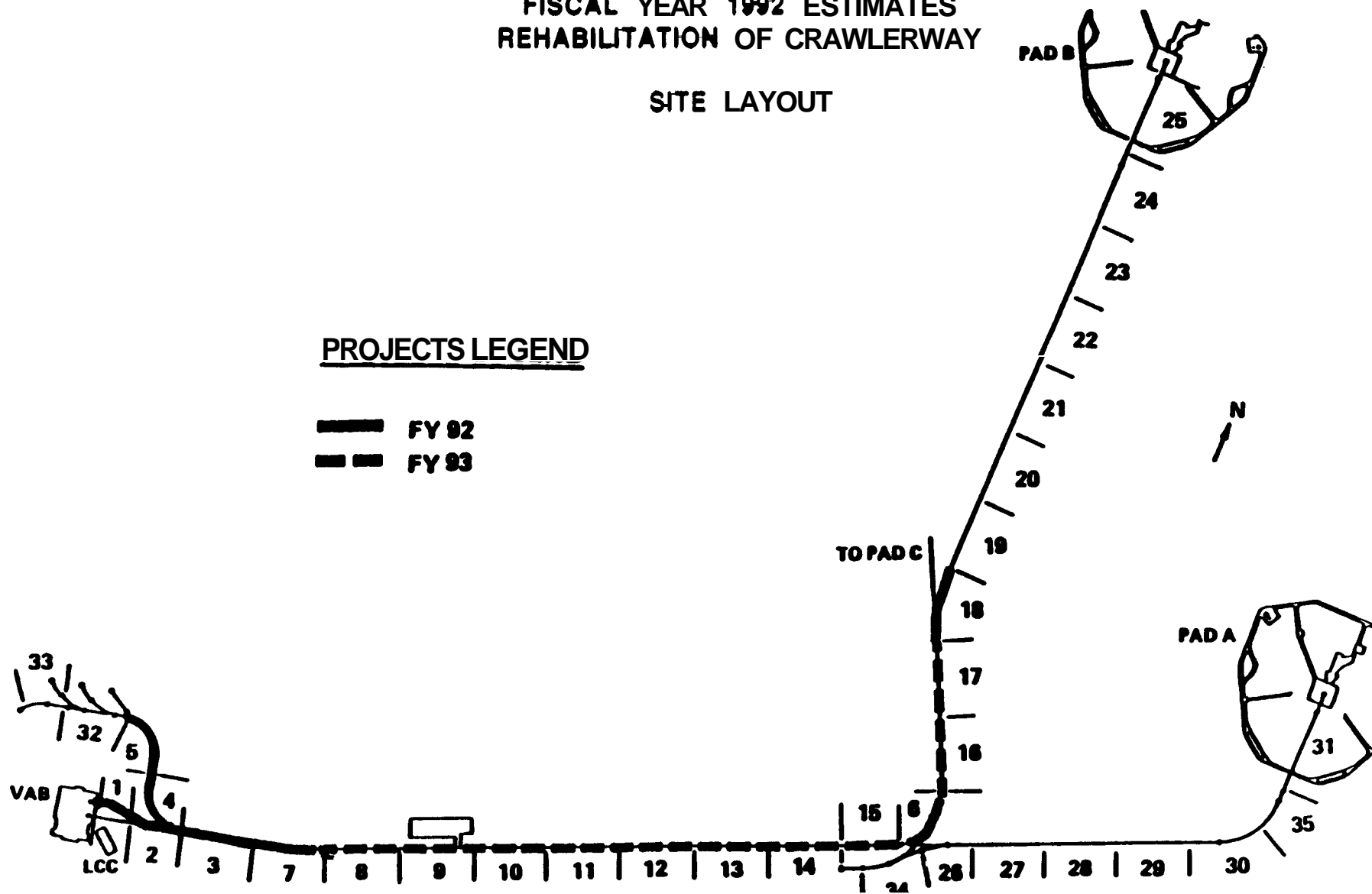


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Restore Shuttle Landing Facility Shoulders

INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: \$4,000,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS FUNDING: The following prior years' funding is related to this project.

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$320,000		\$ 320,000
Capitalized Investment	<u>---</u>	<u>\$22,357,785</u>	<u>22,357,785</u>
Total	<u>\$320,000</u>	<u>\$22,357,785</u>	<u>\$22,677,785</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for restoration of the Shuttle Landing Facility runway 50-foot wide shoulders to their as-built load bearing capacity.

PROJECT JUSTIFICATION:

The Shuttle Landing Facility shoulders have, over time and exposure to weathering, lost their compaction. Load tests indicate that the shoulders are no longer capable of safely supporting the concentrated loads imposed by the orbiter vehicle and/or carrier aircraft. Damage may occur to the landing gear and other vehicle components of the orbiter or carrier aircraft should these vehicles veer off the runway on to the shoulder during landing.

IMPACT OF DELAY:

Failure to restore the Shuttle Landing Facility shoulders to their original load bearing capacity could cause damage to the Shuttle and/or the carrier aircraft if either were to veer off the main runway during normal operations or during a Shuttle emergency landing situation.

PROJECT DESCRIPTION:

This project provides for repair of the 50-foot wide shoulders on each side of the Shuttle Landing Facility runway and replacement of runway edge lighting. Work will consist of removal of existing material on the 50-foot wide shoulders, removal of existing lighting fixtures and conduit, installation of new runway edge lighting system, and replacement and recompaction of Shuttle Landing Facility shoulder material.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$4,000,000</u>
Electrical.....	LS	---	---	800,000
Civil.....	LS	---	---	3,200,000
<u>Total</u>				<u>\$4,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
RESTORE SHUTTLE LANDING FACILITY SHOULDERS

SITE PLAN

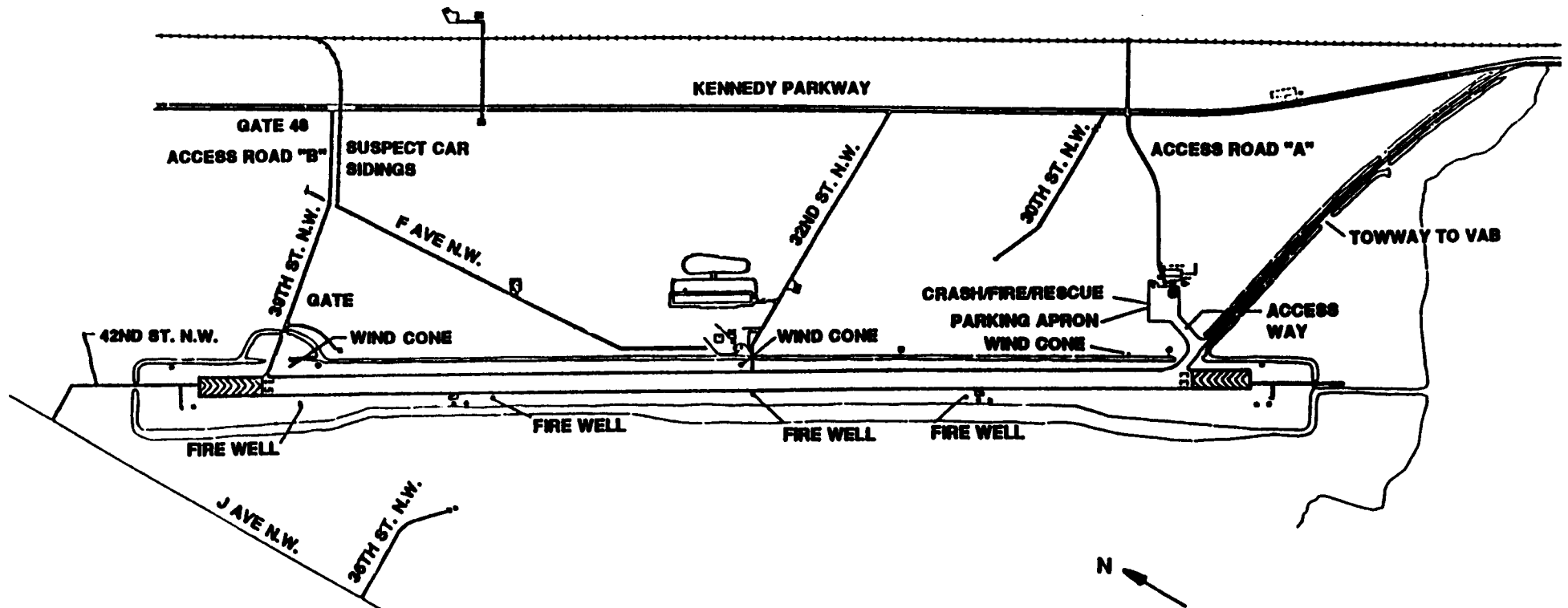


FIGURE 1

FISCAL YEAR 1992 ESTIMATES

INSTALLATION: John C. Stennis Space Center

FY 1992 CoF Estimate: **\$6,500,000**

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$620,000		\$ 620,000
Capitalized Investment.....	<u>-0-</u>	<u>\$4,938,300</u>	<u>4,938,300</u>
Total.....	<u>\$620,000</u>	<u>\$4,938,300</u>	<u>\$5,558,300</u>

This project provides for the design and automation of the high pressure air and helium gas systems in the Li Pressure Gas Facility (3304 and 3305). The project also includes the build and up of the new gas systems to replace the old gas systems. The project also includes the replacement of obsolete components is required to improve the reliability and maintainability of these high pressure gas systems.

The High Pressure (HP) gas system is operated by 25-year-old equipment and obsolete components. Replacement parts are procured by special order only and are very expensive. The delivery times result in extended downtime of the parts processing. In addition, increased high pressure gas system downtime has the available down-time for the Space Shuttle Main Engine (SSME) test and maintenance activities. Restoration of the HP gas system will improve the reliability of these critical high pressure gas systems and ensure maintainability of the facility.

IMPACT OF DELAY:

The HPGF will continue to deteriorate and associated maintenance costs will continue to rise. Risk of extended delays due to the difficulty in obtaining replacement parts will also increase, thereby jeopardizing reliable SSME test program support.

PROJECT DESCRIPTION:

This project provides for the restoration or replacement of various components of the high pressure air and helium gas systems. Project scope includes replacement of two air compressors, two helium compressors* two air dryers, ancillary equipment, and an expansion of the existing electrical substation. Upgrades will be made to the motor control centers, the cooling tower cells, the fire detection/protection system, and the blowdown pit. A 4,400 square foot facility expansion is required to permit the restoration of the facility concurrent with the continuous operation of the high pressure gas systems.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
<u>Construction</u>	---	---	---	<u>\$6,500,000</u>
Air Compressors	EA	2	1,000,000	2,000,000
Air Dryers	EA	2	325,000	650,000
Helium Compressors	EA	2	1,000,000	2,000,000
Civil/Structural	LS	---	---	700,000
Mechanical.....	LS	---	---	450,000
Electrical.....	LS	---	---	700,000
Total..				<u>\$6,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Schematic

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Approximately \$9.0M will be required in FY 1994 for additional restoration and modernization of gas systems.

STENNIS SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
RESTORATION OF HIGH PRESSURE GAS FACILITY

SITE PLAN

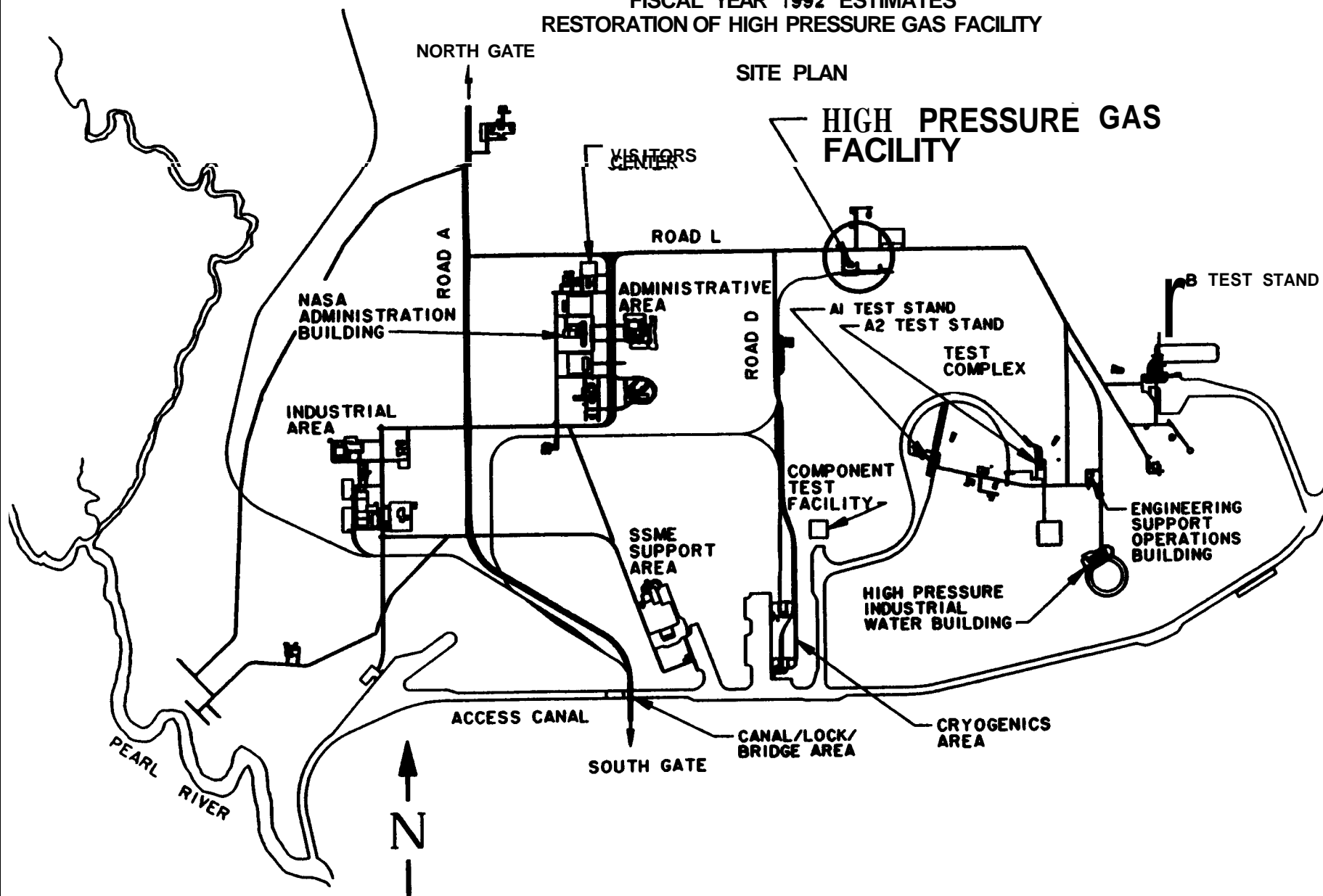


FIGURE 1

**STENNIS SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
RESTORATION OF HIGH PRESSURE GAS FACILITY**

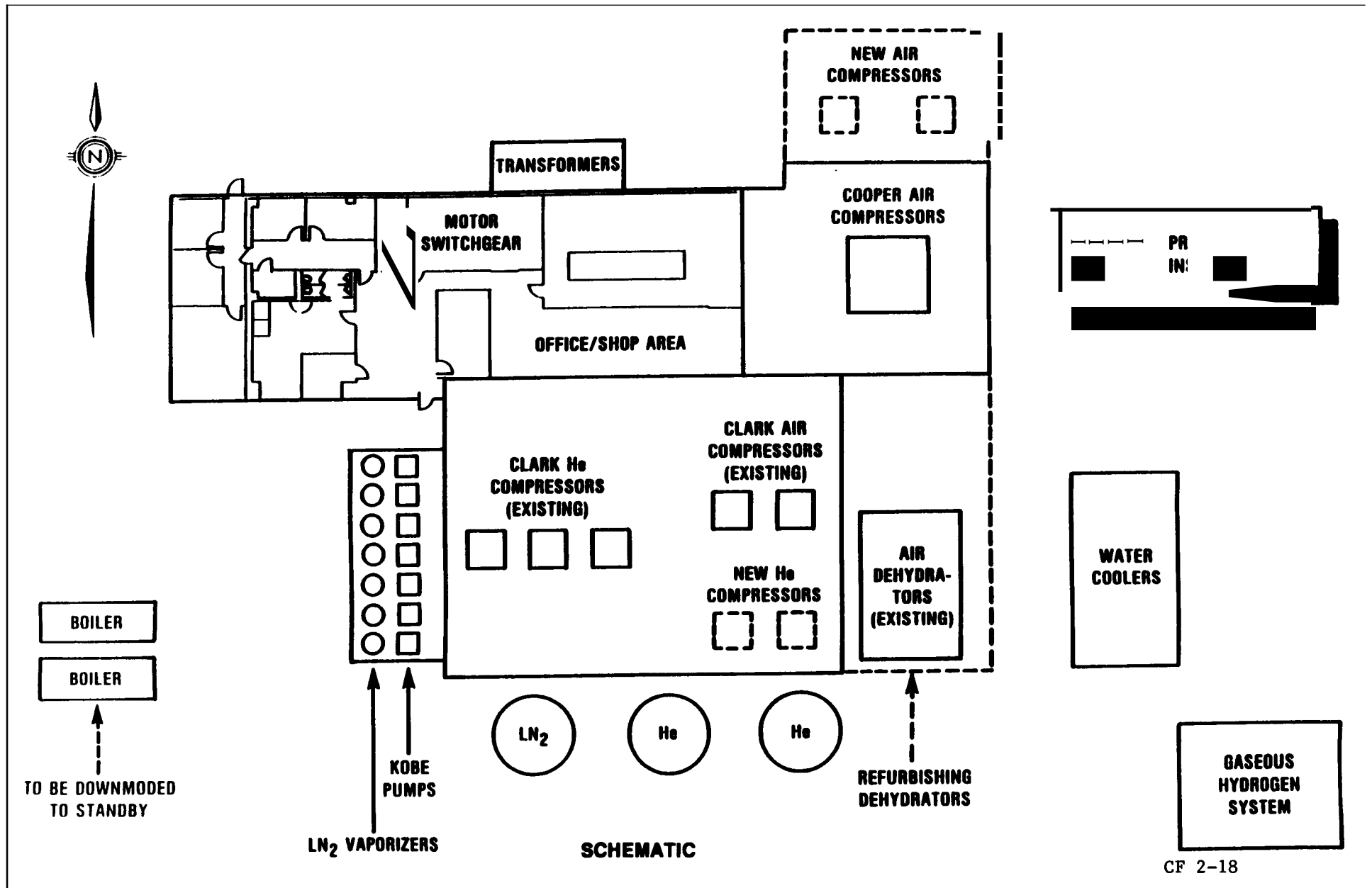


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Construction of Addition for Flight Training and Operations

INSTALLATION: Lyndon B. Johnson Space Center

FY 1992 CoF Estimate: \$13,000,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project.

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$1,705,217	\$12,000,000	\$13,705,217
Capitalized investment.....	<u>---</u>	<u>3,984,295</u>	<u>3,984,295</u>
Total.....	<u>\$1,705,217</u>	<u>\$15,984,295</u>	<u>\$17,689,512</u>

SUMMARY PURPOSE AND SCOPE:

This project provides the final increment of funding for construction of an addition to the existing Flight Operations Facility, Building 4, to meet the combined Space Transportation System (STS) and Space Station Freedom (SSF) operations era requirements for space flight crew members and their training, systems, and flight control support personnel and equipment. This multi-story addition will provide required facility space for offices and related mission support areas, computer-aided training rooms and systems trainers, automated mission and crew procedures/planning/data preparation and configuration, electronically enhanced training/conference rooms, and additional astronaut support library/mailroom/secure storage. This final increment is required to provide a complete and usable facility.

PROJECT JUSTIFICATION:

This project is required to provide integrated office and training space for the increased personnel and systems needed for space flight crew members, training, systems, and flight control support within the Johnson Space Center (JSC) crew training area complex. This additional staffing will require workspace in the crew training complex by 1994. The existing facilities are already overcrowded resulting in very inefficient separation and distribution of personnel and functional groups. The new facility must accommodate the anticipated growth through the 1990's as well as provide for consolidation of existing related personnel, and moving personnel on-site from costly leased space. The size of this building has been increased by value engineering without any significant increase in total budget requirements when compared to the FY 1991 submittal.

The resultant dual-building space flight training and operations support facility provided by this project is critical to meeting the requirements for crew training and mission preparation. The close, active integration of personnel, training, mission preparation, and actual mission support has become exceedingly critical to mission success and will only become more so as STS and SSF operations mature. There are no other facilities at or adjacent to JSC that can provide the crucial integration, efficiency, and effectiveness of this project and its siting within the established unique and invaluable space flight crew training complex.

IMPACT OF DELAY:

If the second increment of this two-phase project is not approved in this fiscal year, it will result in a partially completed unusable facility. This would necessitate additional and expensive activities in out-years to protect materials and systems and to ensure integrity and prevent damage during the construction interruption.

PROJECT DESCRIPTION:

This project provides the final increment of construction of a five-story, 196,000 gross square foot addition sited just to the south of existing Flight Operations Facility, Building 4. The addition will be connected to each of the three floors of Building 4 by an enclosed passageway. An optional sixth floor will be designed. This increment will provide the installation and finishing of the building addition interior features such as walls, ceilings, and raised flooring; complete the mechanical and electrical systems including the installation of remaining building equipment not included in the initial increment; and complete the site work such as pedestrian walkways and paved parking for approximately 1,000 vehicles.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction:</u>	---	---	---	<u>\$13,000,000</u>
Demolition	LS	---	---	23,000
Utilities....	LS	---	---	257,000
Modifications to Existing Building.....	LS	---	---	90,000
Architectural/Structural	LS	---	---	5,866,000
Heating, Ventilating, and Air-conditioning.....	LS	---	---	2,370,000
Plumbing.....	LS	---	---	243,000
Sprinkler.....	LS	---	---	641,000
Electrical.....	LS	---	---	2,814,000
Fire Detection and Telephone Systems.....	LS	---	---	696,000
Total.....				<u>\$13,000,000</u>

NOTE: The total estimated cost of the project, including the FY 1991 increment of \$12 million, is \$25 million.

LIST OF RELATED GRAPHICS: Figure 1 - Perspective

OTHER EQUIPMENT SUMMARY:

\$3,900,000 of non-collateral equipment is required for the initial operation of this facility.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

**LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF ADDITION FOR FLIGHT TRAINING AND OPERATIONS (PHASE 2)**

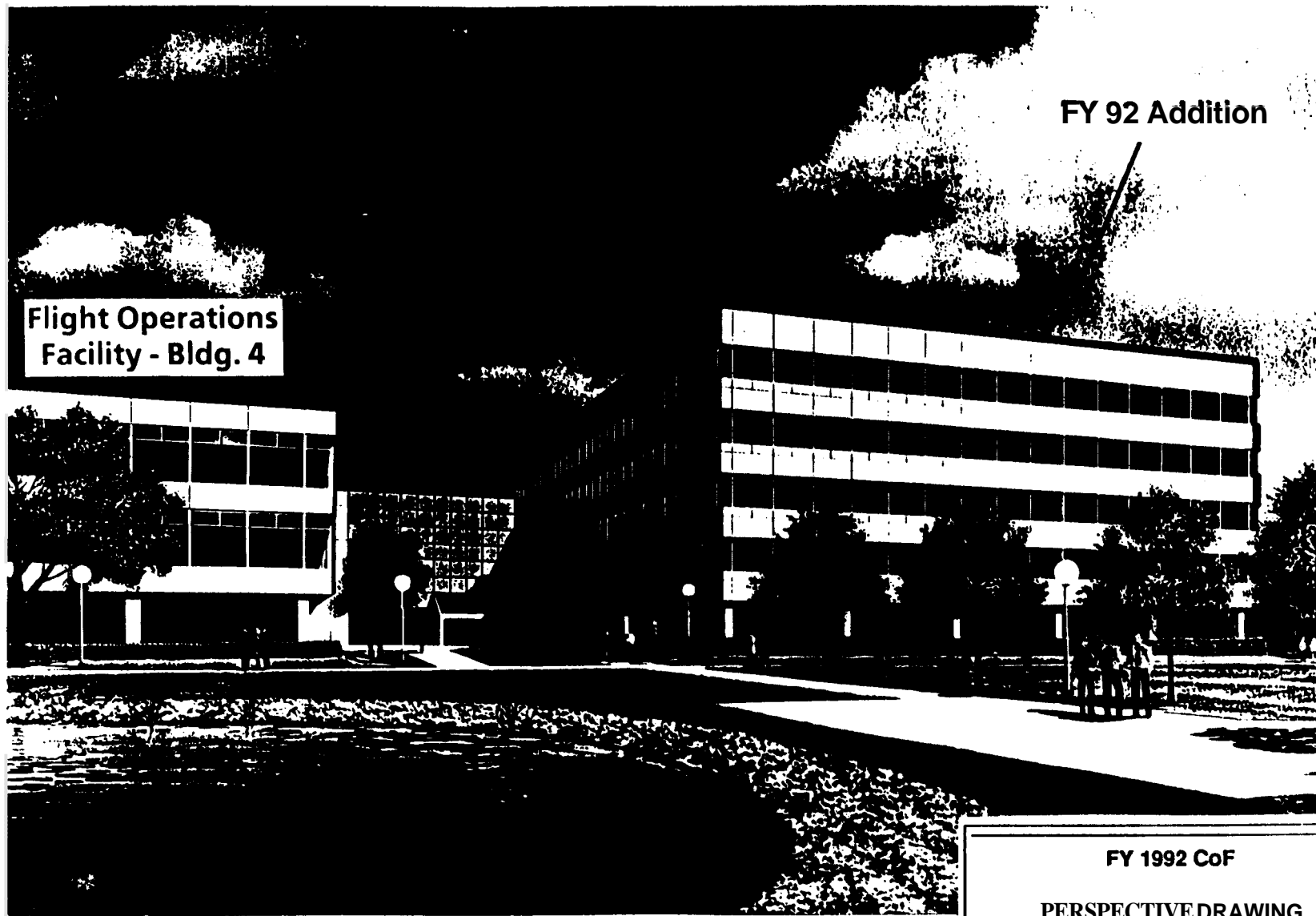


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Construction of Advanced Solid Rocket Motor Program Facilities

INSTALLATION: Various Locations

FY 1992 Estimate: \$150,000,000

LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning, Design and Construction Management	Construction	Total
Specific CoF Funding.....	\$33,000,000	3165,470,000	\$198,470,000
Capitalized Investment.....			
Total.....	\$33,000,000	3165,470,000	\$198,470,000

SUMMARY PURPOSE AND SCOPE:

is continues the : . of Advanced Solid Rocket Motor (ASRM) facility projects, technical support
i and construction management. ASRM is needed t improve margins of safety and a i r :
l payload lift, and add : capabi to the Space Transportation System. The l C site in
N Mississippi is the primary site for the production facilities; Stennis Space Center is the
site : t Michoud : F il i the site for nozzle manufacturing
facilities; and t motor t and assembly l modifications are included at the Kennedy S;
Center. Additional : t turing or test facilities of a r nature may be located at other sites
as required.

F F

The ASI is required to significantly improve t safety and r ty margins of the lid Rocket t
(SRM) and Space Shuttle vehicle by reducing or eliminating more than 00 critical fai modes. It . will
pro i the l with a significant gain in performance by iding an l 12,000 pounds of payload

capability. Moreover, development of the ASRM will establish a strong technical foundation upon which the United States leadership in the highly competitive field of solid fueled rockets can be maintained. Production of the ASRM will require modern and automated facilities with greatly improved manufacturing and quality control processes. The facilities will be designed at a size to support manufacturing of sufficient ASRM flight sets to meet currently-planned Space Shuttle launch rates. The present manufacturing process is labor-intensive with many opportunities for human error and requires excessive inspection efforts to ensure achievement of required standards. The new facilities will incorporate state-of-the-art computer controlled manufacturing and assembly techniques to enhance the reliability and safety margins of the rocket motor, reduce human error and provide more effective inspection techniques.

IMPACT OF DELAY:

Delay of this project will impact the ability of the Space Transportation System to achieve increased reliability and safety margins and increased payload lift.

PROJECT DESCRIPTION:

The total facility construction program and special facility-related equipment are phased over several fiscal years and will include the following major elements of work: site preparation, utilities, manufacturing and production buildings; test facilities; motor handling and assembly facilities; and other support facilities, as required.

The FY 1992 phase of the overall ASRM facility construction program and special facility-related equipment encompass the following:

Continuation of work for: site preparation including fencing, railroad and parking lots; expansion and extension of existing utilities including raw water, potable water, storm and sanitary sewer, waste treatment, electrical substations and power distribution and communications systems; static test complex including test stand, control building, hydrotest stand, meteorological facility and barge dock; motor propellant mix/cast/cure complex; motor case refurbishment and preparation facility; motor finish facility; non-destructive test (NDT) facility; nozzle manufacturing complex; production support office; quality assurance test laboratory; security/medical facility; fire station; warehouse buildings and transient/pressure test facility; beginning construction of a rotation/processing/storage facility and barge dock modifications; and procurement of long lead-time, special facility-related items of equipment that directly impact the final configuration of the facilities and supporting utility systems.

FY 1992 PROJECT COST ESTIMATE:

The preliminary cost estimate is based upon initial site plans, developing program concepts and maturing designs of selected key facilities. As the solid rocket motor design matures, site activities commence, and facility designs progress, it is expected that priorities may change and revisions and/or additions to the following facilities and estimated costs may be necessary.

	<u>FY 89/90/91</u>	<u>FY 92</u>
<u>Land Acquisition</u>	<u>\$ 5,700,000</u>	<u>---</u>
<u>Technical Support, Studies, Design & Construction Management</u>	<u>33,000,000</u>	<u>\$11,824,000</u>
<u>Construction</u>	<u>159,770,000</u>	<u>88,176,000</u>
Site/utilities	(22,900,000)	(14,477,000)
Motor Propellant Mix/Cast	(47,600,000)	(26,253,000)
Motor Case Prep/Refurb	(25,300,000)	(6,532,000)
Motor Finish/NDE	(22,300,000)	(4,877,000)
Nozzle Manufacture Complex (MAF).....	(10,200,000)	(3,137,000)
Static Test Complex (SSC).....	(6,700,000)	(3,433,000)
Component Test Complex (MSFC).....	(6,000,000)	(592,000)
Handling & Assembly Facilities (KSC).....	(14,400,000)	(24,200,000)
Support Facilities.....	(4,370,000)	(4,675,000)
Subtotal.....	<u>198,470,000</u>	<u>100,000,000</u>
<u>Special Facility-Related Equipment</u>	<u>---</u>	<u>50,000,000</u>
Total.....	<u>\$198,470,000</u>	<u>~150,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1: ASRM-Yellow Creek Site Figure 2: ASRM-Michoud Nozzle Manufacture Site
 Figure 3: ASRM-Stennis Test Site.

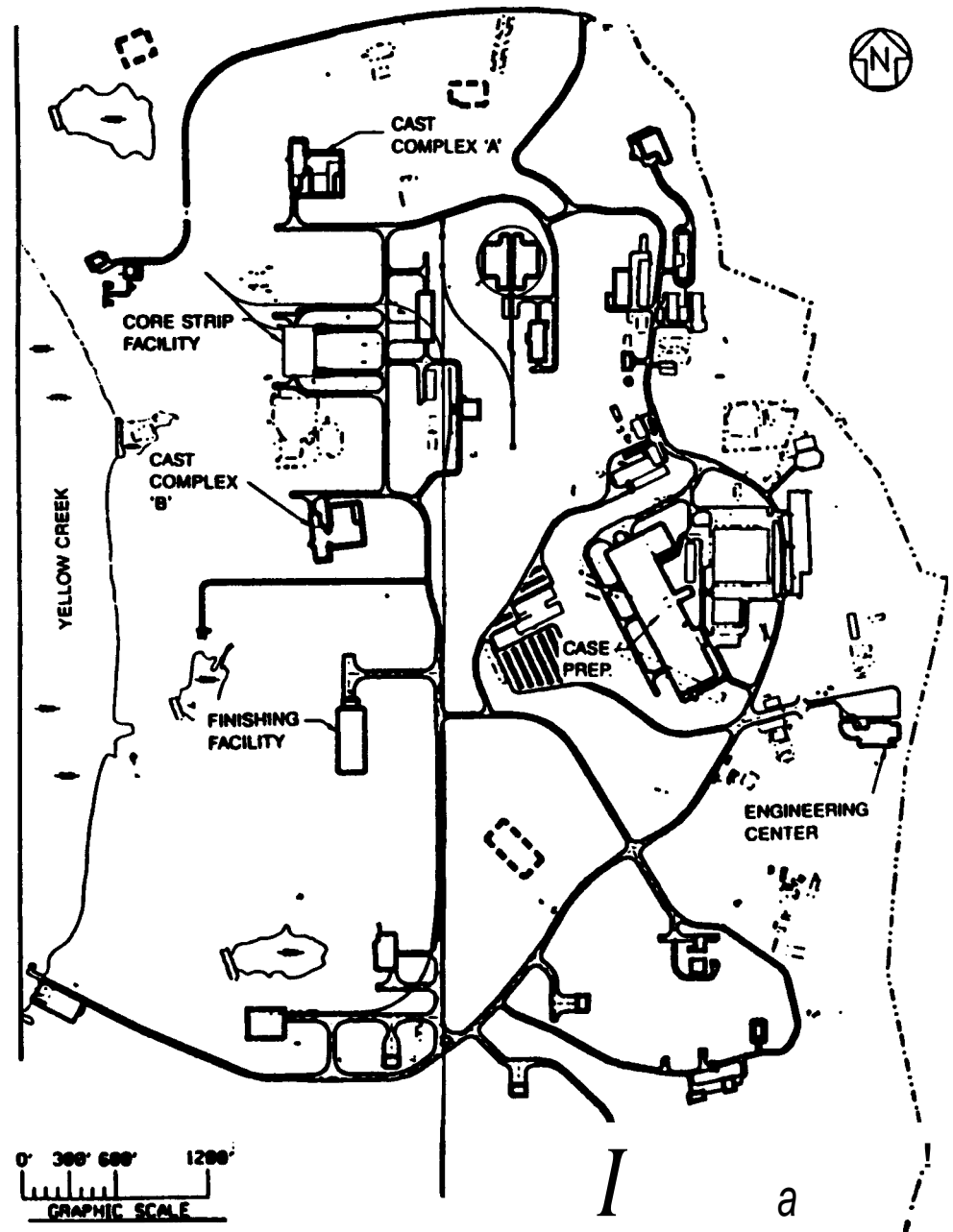
OTHER EQUIPMENT SUMMARY: Other equipment to be funded from SFCDC resources is estimated to cost approximately \$250 million, however, this amount may change as the program matures.

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

The total CoF cost for all ASRM facilities construction at various locations is approximately \$400 million. It is estimated that \$101,600,000 will be required in FY 1993.

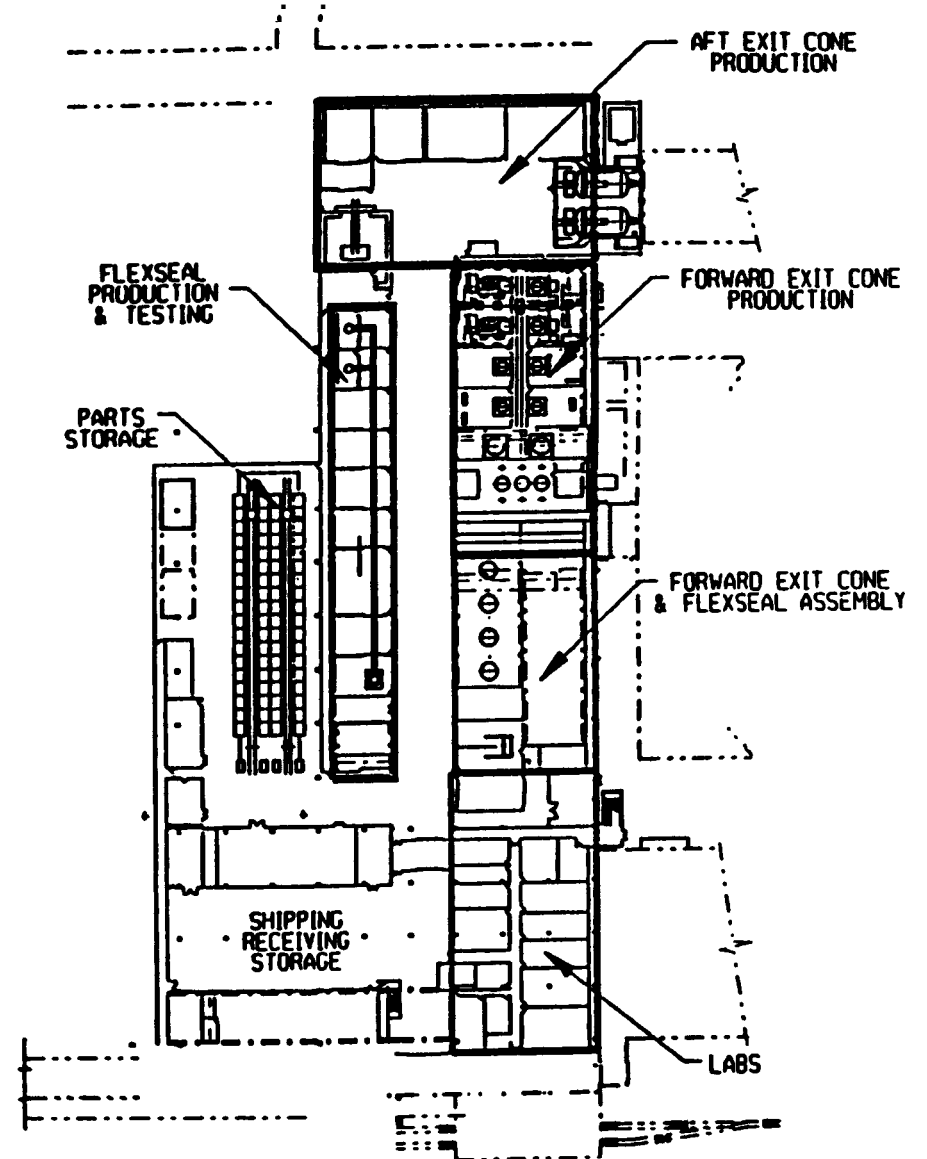
CONSTRUCTION OF
ADVANCED SOLID ROCKET MOTOR FACILITIES
FISCAL YEAR 1992 ESTIMATES
YELLOW CREEK SITE

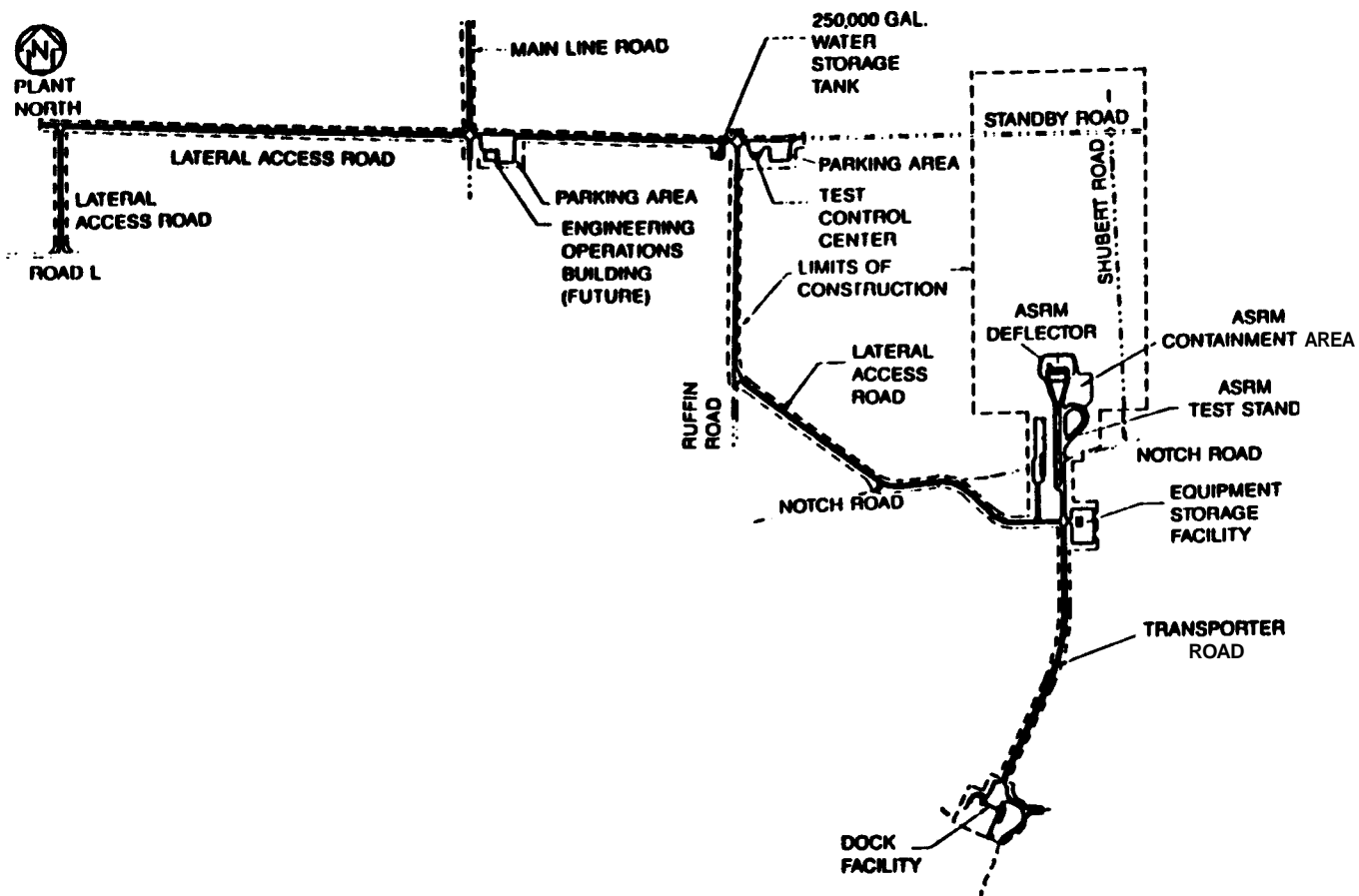
FIGURE 1



CONSTRUCTION OF
 ADVANCED SOLID I MOTOR CIL
 FISCAL YEAR 1992
 NOZZLE MANUFACTURE SITE

FIGURE 2





CONSTRUCTION OF ADVANCED SOLID ROCKET MOTOR FACILITIES
FISCAL YEAR 1992 ESTIMATES
STENNIS TEST SITE

FIGURE 3

KENNEDY
SPACE CENTER



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

KENNEDY SPACE CENTER

Office of Space Flight: -----	Amount ----- (Dollars)	Page No. -----
Modernization of Industrial Area Chilled Water System.....	4,000,000	CF 3-1
Rehabilitation and Expansion of Communications Duct Banks.....	1,400,000	CF 3-5
Replace 15 KV Load Break Switches,	1,300,000 -----	CF 3-9
 Total..	 6,700,000 =====	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modernize Industrial Area Chiller Water System

INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: \$4,000,000

LOCATION OF PROJECT: John F. Kennedy Space Center. Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	<u>\$404,000</u>	<u>---</u>	<u>\$404,000</u>
Capitalized Investment.....	<u>---</u>	<u>---</u>	<u>---</u>
Total.....	<u>\$404,000</u>	<u>---</u>	<u>\$404,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of a chilled water "loop" system to connect the major buildings in the KSC Industrial Area. This loop will increase current operating redundancy and reliability and will establish a lower cost system for future replacement of worn out chillers.

PROJECT JUSTIFICATION:

Over the next several years, replacement of worn out chillers and the addition of new equipment for new facilities in the industrial area will be required. Analysis indicates that the construction of a chilled water loop system can result in significant savings in replacement chiller costs and operation costs. The loop system would permit optimization of existing chiller capacity and reduce the future number and cost of chiller replacements. Excessive maintenance costs for existing small, individualized building refrigeration systems will be greatly reduced with a loop system. A loop system will also allow for meeting redundancy requirements with fewer chillers, thereby saving equipment costs.

IMPACT OF DELAY:

If this project is not approved, inefficient operation of refrigeration equipment for the major facilities in the industrial area will continue and more replacement chillers will need to be purchased in the future than would otherwise be necessary.

PROJECT DESCRIPTION:

This project provides for construction of a chilled water loop which will interconnect the existing chillers serving all major facilities in the Industrial Area into a common system. These facilities are: Headquarters Building, Central Instrumentation Facility, Occupational Health Facility, Operations and Checkout Building, and Cargo Support Building. Provision for future connection to the training auditorium, Engineering Development Laboratory, Space Station Processing Facility and a future science and engineering laboratory will be included. Controls will be integrated to provide selected chillers on line as needed to meet air conditioning requirements. Replacement chilling capacity may be provided on a select basis.

PROJECT COST ESTIMATE: This cost estimate is based on a completed Engineering Study.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction.....</u>	---	---	---	<u>\$4,000,000</u>
Demolition.....	LS	---	---	200,000
Install Chilled Water Loop				
Equipment and Piping.....	LS	---	---	3, 50,000
Controls.....	LS	---	---	250,000
Total.....				<u>\$4,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Perspective

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional funds will be required to modify the existing system to permit disconnecting of unneeded chillers and change the distribution system.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
MODERNIZE INDUSTRIAL AREA CHILLED WATER SYSTEM

SITE PLAN
KSC INDUSTRIAL AREA

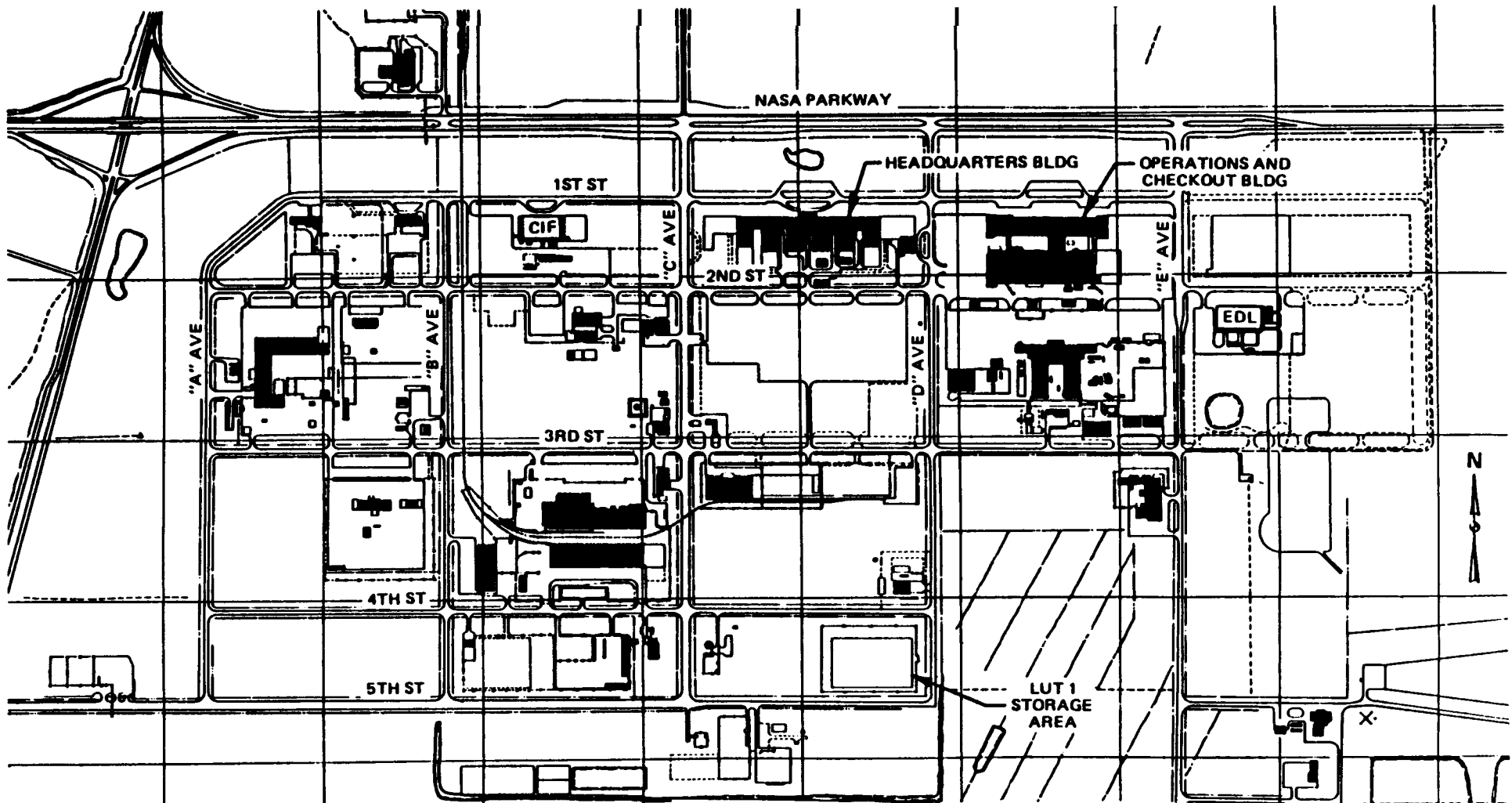
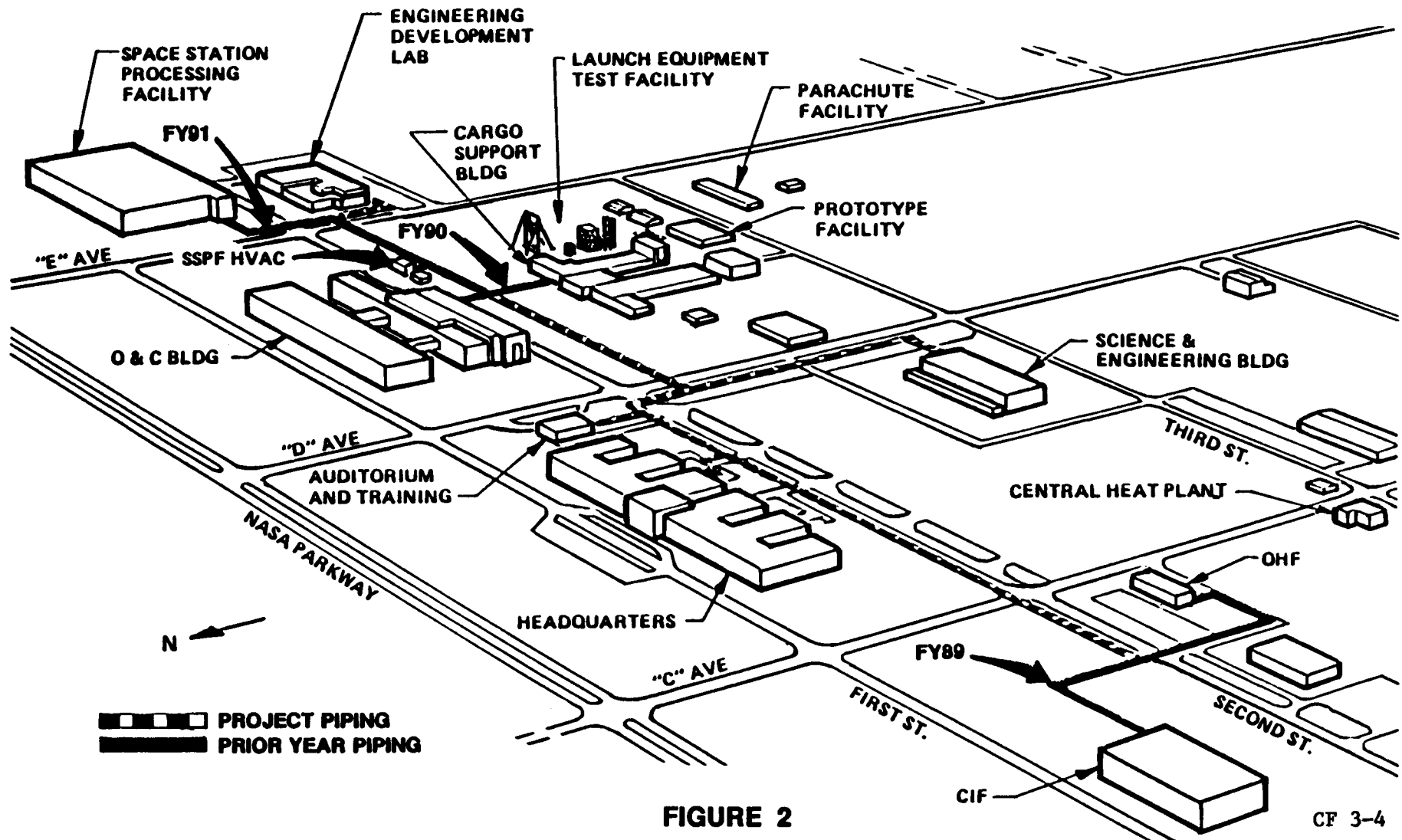


FIGURE 1

CF 3-3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
MODERNIZE INDUSTRIAL AREA CHILLED WATER SYSTEM

PERSPECTIVE
INDUSTRIAL AREA



CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation and Expansion of Communications Duct Banks
INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: 31,400,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	3 96,800		396,800
Capitalized Investment.....	<u>---</u>	<u>\$26,928,050</u>	<u>26,928,050</u>
Total.....	<u>3 96,800</u>	<u>\$26,928,050</u>	<u>\$27,024,850</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the installation of cable duct **banks** to meet current and future communications and data circuit requirements. Adequate duct space will be made available to install new cables to the industrial area, Hypergol Maintenance Facility area, and Launch Complex 39 area.

PROJECT JUSTIFICATION:

The existing underground ~~duct banks~~ was installed ~~pp~~ **y** 20 years ago. Numerous ~~obl~~ **obl** have been encountered during the ~~in~~ **of** new **communications cables** ~~nto~~ **into** the ~~sting~~ **sting** spare ducts. **Deterioration** of the existing fibrous ~~ts~~ **ts** has ~~l~~ **l** or ~~omplete~~ **omplete** blocked ~~t~~ **t** ducts. Spare ducts to ~~i~~ **i** are not available to meet **future** needs.

IMPACT OF DELAY:

There is insufficient duct bank space to meet future construction projects needs and existing ducts are full or damaged. Communication lines, data systems and control cables will become dangerously overloaded if additional ducts are not provided.

PROJECT DESCRIPTION:

This project will install approximately 22,100 linear feet of new duct banks in the Industrial area, Maintenance Facility, and Launch Complex 39 area. Manholes with damaged linings in the Launch Complex 39 area will be replaced. Cables will be rerouted from ducts to create space in the ducts for additional cables.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	cost
Construction.....	---	---	---	\$1,400,000
Manholes.....	EA	70	4,885.72	342,000
Duct Banks.....	LF	22,100	38.78	857,000
Cable Pulls.....	LS	---	---	135,000
Road Crossing.....	LS	---	---	50,000
Comm Room.....	LS	---	---	16,000
Total.....				\$1,400,000

LIST OF RELATED GRAPHICS: Figure 1 - Industrial Area Site Plan Figure 2 - Launch Complex-39 Area Site Plan.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION AND EXPANSION OF COMMUNICATIONS DUCT BANKS

INDUSTRIAL AREA SITE PLAN

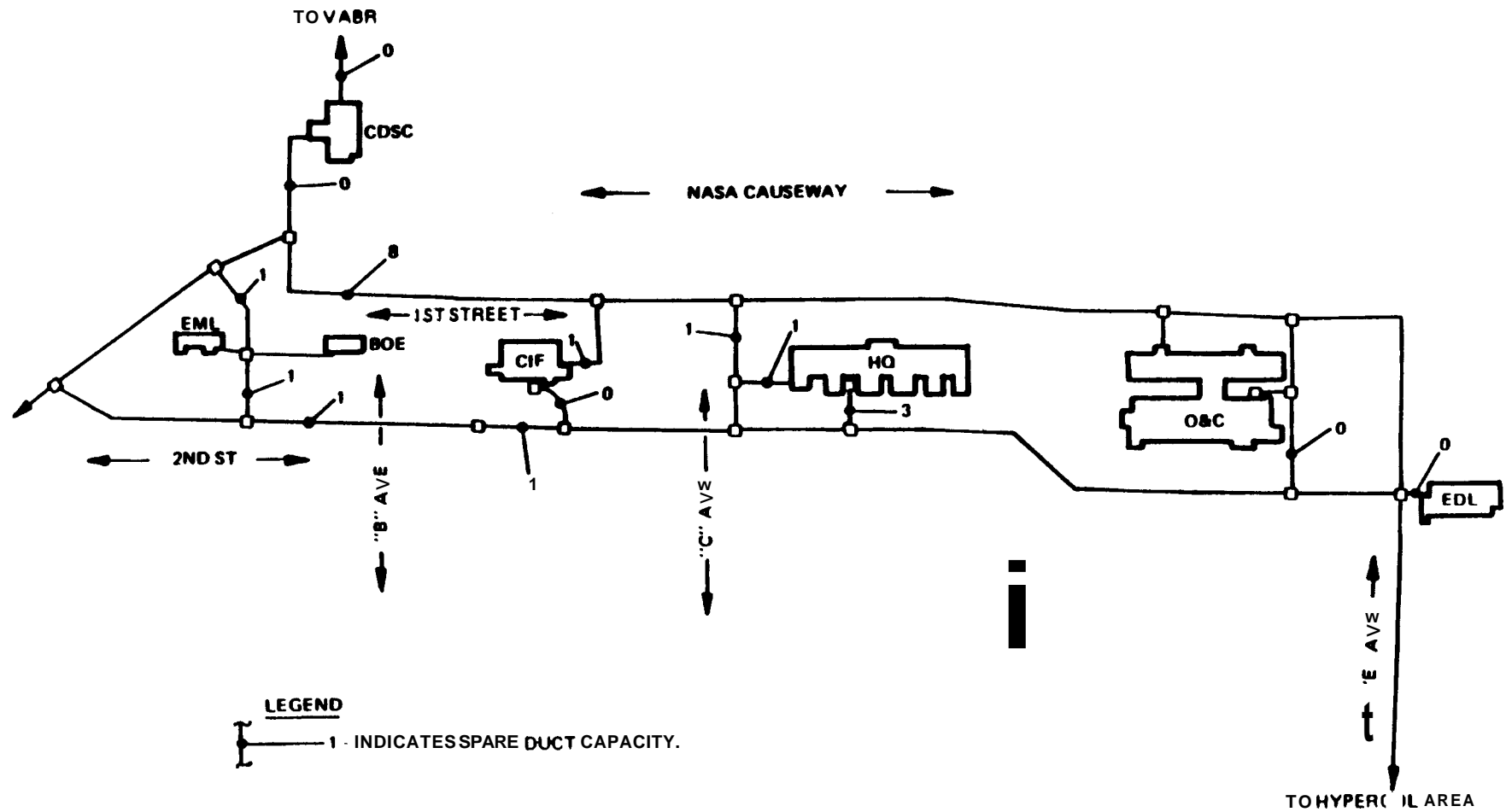


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION AND EXPANSION OF COMMUNICATIONS DUCT BANKS

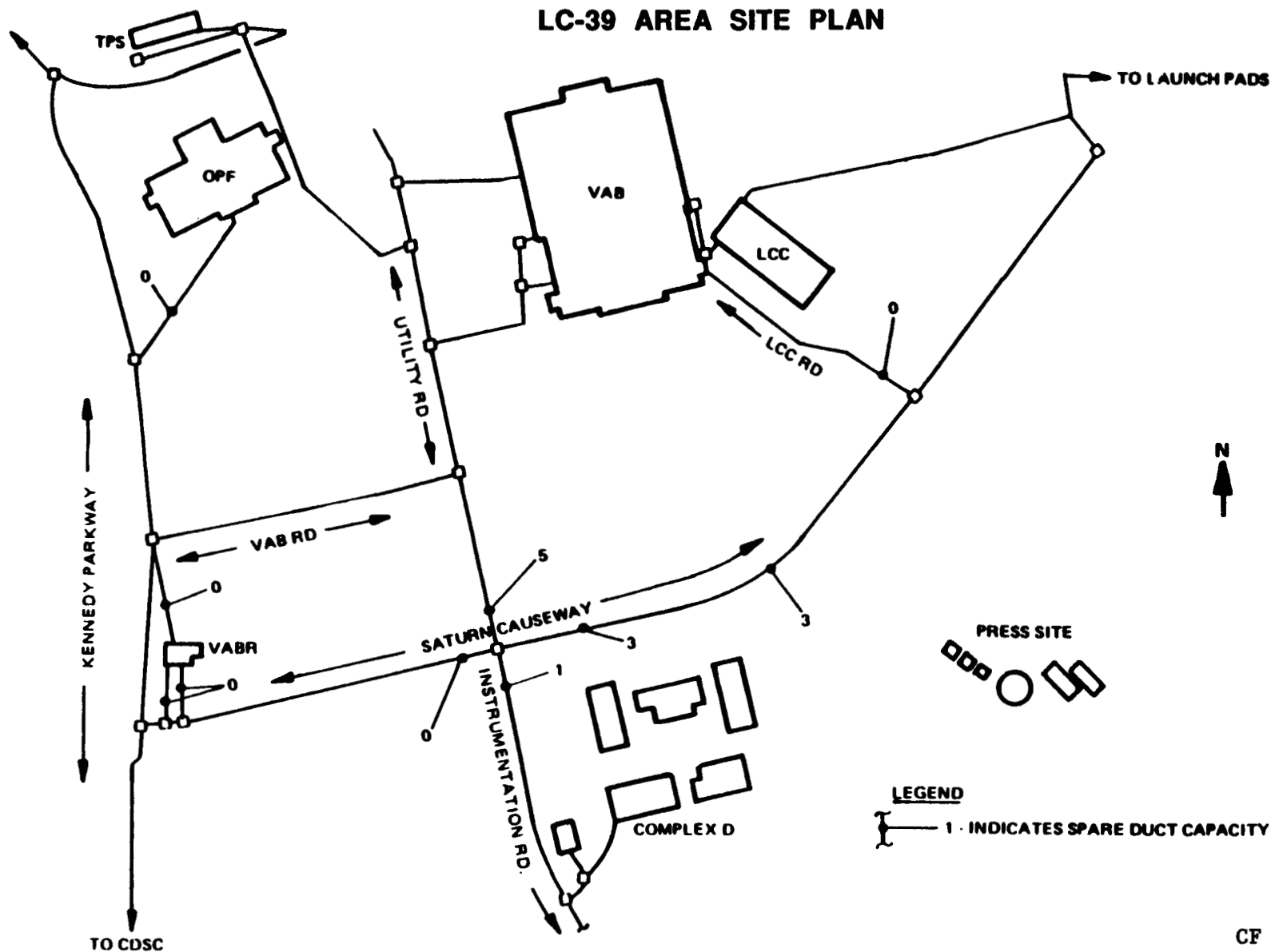


FIGURE 2

CF 3-a

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Replace 15KV Load Break Switches

INSTALLATION: John F. Kennedy Space Center

FY 1992 CoF Estimate: \$1,300,000

LOCATION OF PROJECT: **John** F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$103,000		\$ 103,000
Capitalized Investment.....	<u>---</u>	<u>\$16,203,619</u>	<u>16,203,619</u>
Total.....	<u>\$103,000</u>	<u>\$16,203,619</u>	<u>\$16,306,619</u>

SUMMARY PURPOSE AND SCOPE:

This project will replace sixty-six obsolete high voltage manual oil break switches to preclude risk of failure during operation. The switches have deteriorated to a condition where they are not safe to manually operate under load.

PROJECT JUSTIFICATION:

This project is required to eliminate safety hazards to operating personnel. The type of oil load break switch being replaced has a history of exploding when manually operated under load. As a result, operating personnel are no longer allowed to operate these switches when they are under load. This has reduced NASA's ability to make changes in electrical distribution circuits. This project provides new design, remotely operated switches which will eliminate the danger and enhance operational flexibility. Since replacement parts for the existing switches are no longer available from the manufacturer, the switches are almost impossible to maintain.

IMPACT OF DELAY:

Several life threatening/catastrophic failures have been reported by other government and military installations where similar switches are installed. Delay in replacement requires continuation of administrative controls which limit the ability to control the electrical distribution system in order to protect operating personnel from a dangerous situation.

PROJECT DESCRIPTION:

The manual-type oil load break switches will be replaced with newer-style switches incorporating compression spring operators. Switch ratings will increase from 400 amps to 600 **amps** with close into fault ratings of 40,000amps. The new load break switches will use sulfurhexafluoride (SF-6) instead of oil.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	cost
<u>Construction.....</u>	---	---	---	<u>\$1,300,000</u>
Switch Mechanism.....	EA	61	16,065.57	980,000
Switch Mechanism Installation.....	LS	---	---	170,000
Switch.....	EA	5	20,000.00	100,000
Switch Installation.....	LS	---	---	50,000
Total.....				<u><u>\$1,300,000</u></u>

LIST OF RELATED GRAPHICS: Figure 1 - Illustration

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REPLACE 15-KV LOAD BREAK SWITCHES

ILLUSTRATION

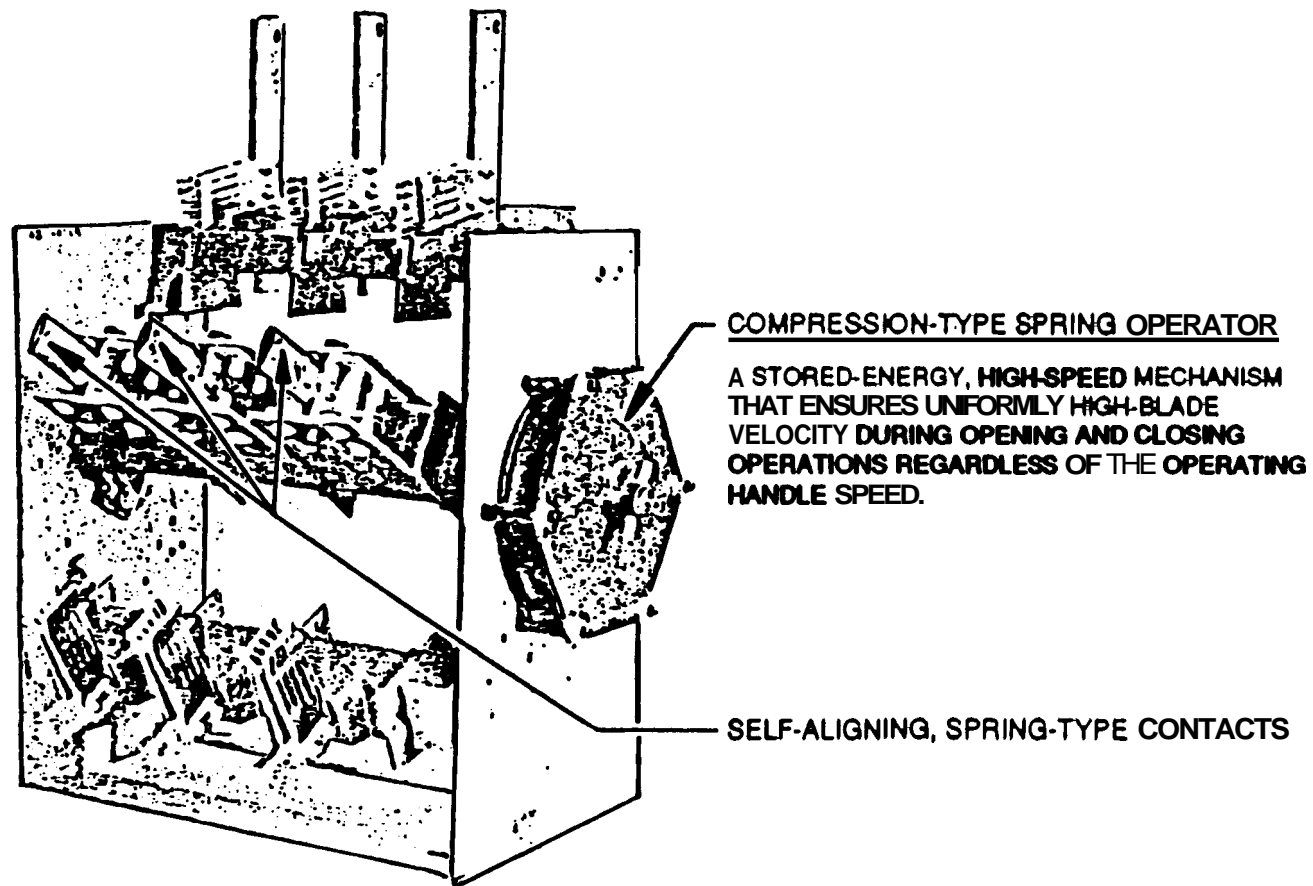


FIGURE 1

JOHNSON
SPACE CENTER

1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

JOHNSON SPACE CENTER

Office of Space Flight: -----	Amount ----- (Dollars)	Page No. -----
Repair Site Water System, White Sands Test Facility	1,300,000	CF 4-1
Replace Central Plant Chillers and Boiler	5,700,000	CF 4-4
Total.. ..	7,000,000 =====	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Repair Site Water System

INSTALLATION: White Sands Test Facility

FY 1992 CoF Estimate: \$1,300,000

LOCATION OF PROJECT: Las Cruces, Dona Ana County, New Mexico

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$83,500	---	3 83,500
Capitalized Investment.....	<u>---</u>	<u>\$900,050</u>	<u>900,050</u>
Total.....	<u>\$83,500</u>	<u>3900,050</u>	<u>\$983,550</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the repair of various components of the existing water system throughout the White Sands Test Facility (WSTF) and adds new components which are required to improve system operation. **Most** of the water system's deteriorating components will have been in service for **30** years and are in serious need of replacement.

PROJECT JUSTIFICATION:

The utilities and structures at WSIF were constructed in 1963 to support the Apollo **Program** and were designed for a 10-year lifespan. There has been a steady deterioration of the water system's components over the past several years. Additionally, construction of the first Tracking and Data Relay Satellite System (TDRSS) ground terminal facility, the Air Force communications facility, and the second TDRSS ground terminal facility have significantly increased the population utilizing the water system and increasing water consumption/demand

for regular operations and fire protection requirements. During this same time period, additional buildings and facilities have been constructed to support the increased scope of the testing mission, thereby further increasing the load on the existing outdated water system.

IMPACT OF DELAY:

If this project is not approved, WSIF faces a possible loss of test data or an entire test stand if a water failure were to occur during a test. In July 1989 the 400 Test Area was shut down for three weeks for emergency water system repairs.

PROJECT DESCRIPTION:

The work includes drilling an additional site water supply well and replacing failing carbon steel waterlines both underground and in buildings. The out-of-date electromagnetic system controls will be replaced with state-of-the-art microprocessor controls. Also, the interior and exterior of the 1,000,000-gallon water storage tank will be renovated. Booster pump, motor, starter equipment and shelters will be replaced and reliable booster pumps and motors will be installed. Defective fire hydrants and failing, buried shutoff valves will be replaced. The project also includes moving and re-installing an existing 80,000-gallon supplementary water storage tank. Additionally, the project will provide a soft water system for the cafeteria and the major air-conditioning systems.

PROJECT COST ESTIMATE:

	Unit of <u>Measure</u>	<u>Quantity</u>	Unit <u>cost</u>	<u>cost</u>
<u>Construction.....</u>				<u>\$1,300,000</u>
Additional Water Supply Well & Soft Water System...	LS	---	---	550,100
Replace Galvanized Pipe & Firex Stands.....	LS	---	---	350,600
Repair Control Panels	LS	---	---	150,300
Site Water Storage Tank.....	LS	---	---	100,200
Reroute Piping, Install Regulator Pits.....	LS	---	---	59,200
Replace Booster Pumps/Motors, Valves.....	LS	---	---	89,600
Total..				<u>\$1,300,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Location Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REPAIR SITE WATER SYSTEM, WHITE SANDS TEST FACILITY

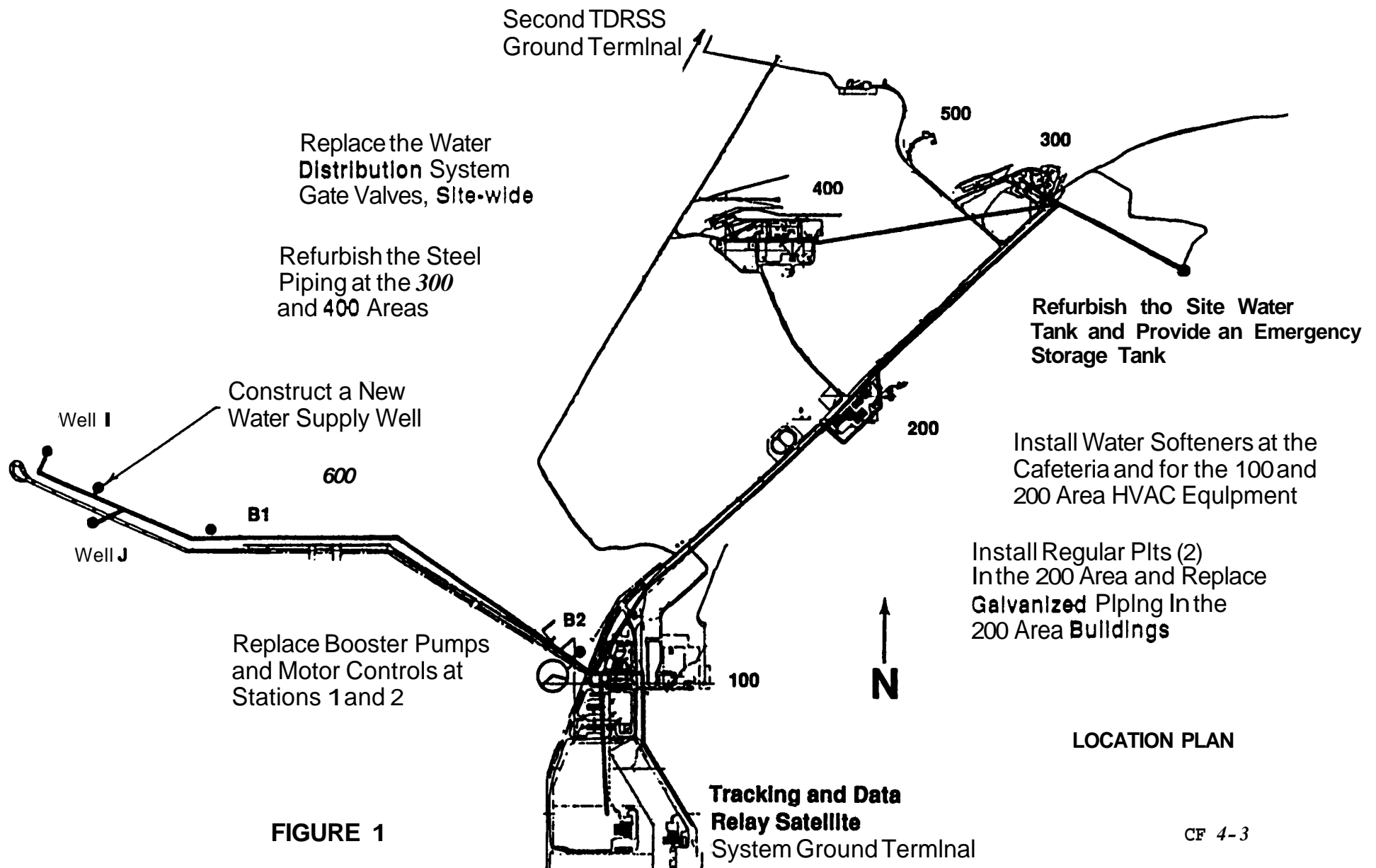


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Replace Central Plant Chillers and Boiler

INSTALLATION: Lyndon B. Johnson Space Center

FY 1992 CoF Estimate: \$5,700,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$616,746	\$2,760,000	\$3,376,746
Capitalized Investment.....	---	<u>9,069,776</u>	<u>9,069,776</u>
Total.....	<u>\$616,746</u>	<u>\$11,829,776</u>	<u>\$12,446,522</u>

SUMMARY PURPOSE AND SCOPE:

This project continues the replacement of major equipment components of the water chilling system in the Central Heating and Cooling Plant at the Johnson Space Center (JSC). This increment replaces two 2,000-ton steam turbine chillers and one **65,000-lb./hr.** steam boiler.

PROJECT JUSTIFICATION:

Rehabilitation of the Central Heating and Cooling Plant's chilled water system is necessary due to the deteriorating condition of existing chillers and boilers which are near the end of their 30-year life expectancy. The existing equipment is becoming increasingly unreliable and expensive to maintain. A dependable chilled water supply is critical to the Center's ongoing air-conditioning and process cooling operations. The chilled water produced by this system supports all major mission-related and institutional buildings. A study of the chilled water system indicated that it is essential to start replacement of major components now in order to prevent serious unscheduled shutdowns. In addition, the chillers will be replaced with equipment using types of refrigerants which are not subject to the Montreal Protocol limiting production of chlorofluorocarbon compounds which damage the Earth's ozone layer.

IMPACT OF DELAY:

If this project is not approved, the JSC ability to provide needed cooling for personnel and equipment will be in jeopardy. If timely phased equipment replacement is not accomplished, critical emergency situations and repairs will be required with increased frequency.

PROJECT DESCRIPTION:

This increment will replace two 2,000-ton steam turbine water chilling units (WCU-1 and WCU-2) and one 65,000-lb./hr. steam boiler (24-1). The new equipment will have identical capacity and capability, but will incorporate current technology and microprocessor controls. The work of the project includes dismantling and removing the existing chillers and boiler, abating asbestos pipe and turbine insulation, partially dismantling the building 24 structure for removing existing equipment, modifying piping, purchasing and placing the new equipment, and reassembling the building structure.

PROJECT COST ESTIMATE: This cost estimate is based on a preliminary engineering report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction:</u>				<u>\$5,700 ,000</u>
Replace Chillers.....	EA	2	1,828,000	3,656,000
Replace Steam Boiler.....	EA	1	1,329,000	1,329,000
Replace Controls.....	LS	---	---	329,000
Electrical Modifications.....	LS	---	---	386,000
Total.....			<u>\$5,700,000</u>

LIST OF RELATED GRAPHIC: Figure 1 - Cutaway Drawing

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Future funding for completion of the replacement of major cooling equipment consists of approximately \$4,000,000 in FY 1993, \$5,700,000 in FY 1995, and \$7,500,000 in FY 1997.

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1992 ESTIMATES
REPLACE CENTRAL PLANT CHILLERS AND BOILER

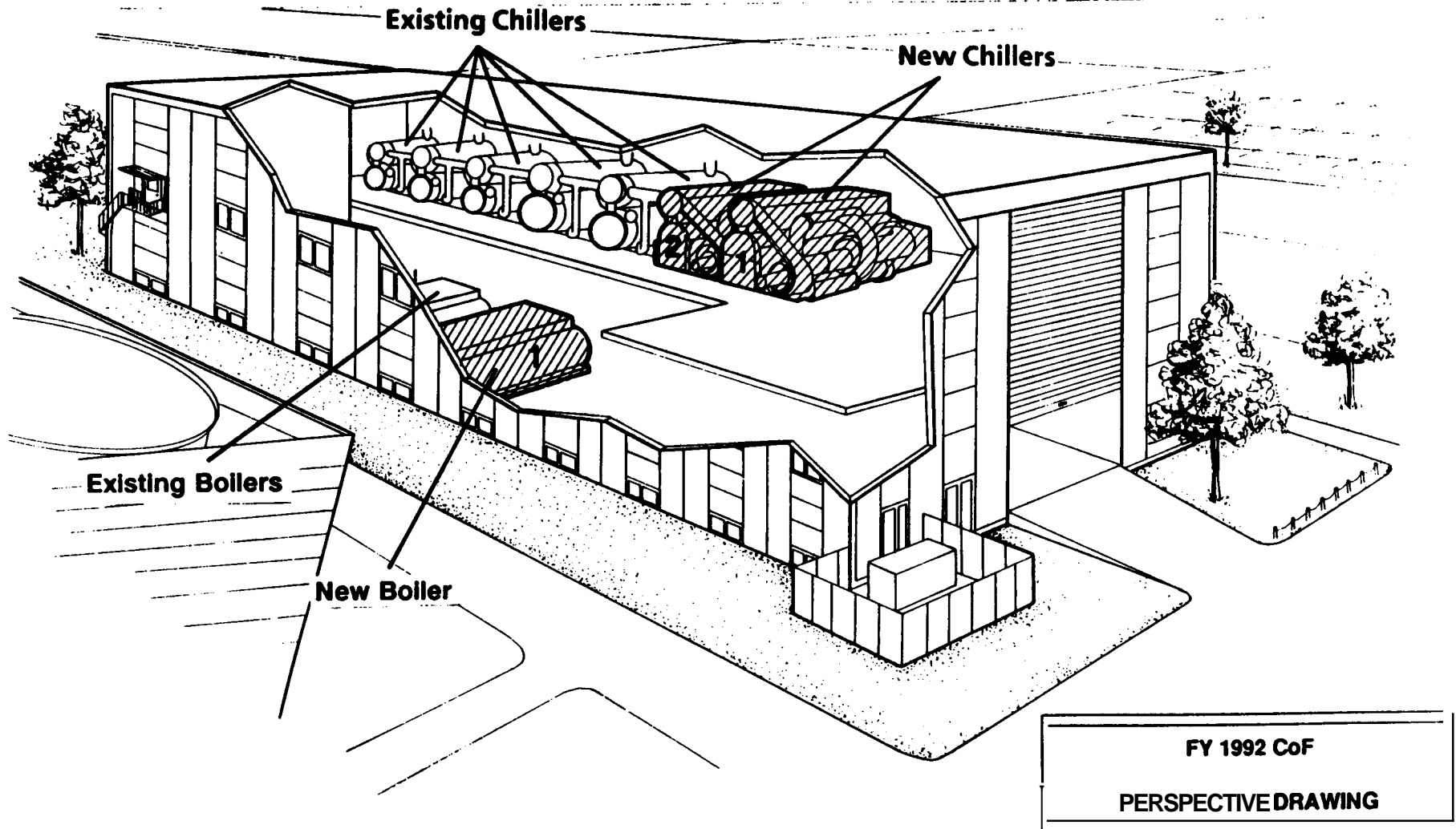


FIGURE 1

MARSHALL
SPACE FLIGHT CENTER



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

MARSHALL SPACE FLIGHT CENTER

	Amount	Page
	-----	No.
	(Dollars)	-----
Office of Space Science and Applications: -----		
Modifications to X- Calibration Facility (XRCF).	5,200,000	CF 5-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modifications to X-ray Calibration Facility (XRCF)

INSTALLATION: George C. Marshall Space Flight Center

FY 1992 CoF ESTIMATES: \$ 5,200,000

LOCATION OF PROJECT: Marshall Space Flight Center, Madison County, Alabama

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$898,000	\$12,540,000	\$13,438,000
Capitalized Investment	---	---	---
Total	<u>\$898,000</u>	<u>\$12,540,000</u>	<u>\$13,438,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for modifications to the X-Ray Calibration Facility (XRCF) in support of the Advanced X-Ray Astrophysics Facility (AXAF). The modifications are required to permit final ground testing and calibration of the High Resolution Mirror Assembly (HRMA) and Science Instruments (SI). The HRMA and SI's must be ground tested and calibrated before launch to verify X-ray performance and to provide baseline data for correlation with flight data. In order to accomplish these tasks, this project will upgrade the class 10,000 clean room to a nominal class 100, add cryogenic shrouds and heat shields to the vacuum chamber cylindrical walls, increase the pumping capacity of the vacuum systems, and modify the liquid nitrogen system.

PROJECT JUSTIFICATION:

The full scope of work for this requirement was approved by Congress as part of NASA's FY 1989 CoF program. However, due to cost problems, the Congress was subsequently notified that a portion of the scope would be deferred until the FY 1992 budget request which separated the project into two phases. The first phase

(FY 1989) is currently under construction. The FY 1989 phase will enable "proof-of-principle" testing of the outer mirror elements of the HRMA mounted in a ground test configuration. This second phase (FY 1992) provides for the scope that had to be deferred from the original FY 1989 project and will permit final testing and calibration of the fully assembled HRMA and SI's. Such testing is mandatory for evaluation of the x-ray reflection efficiency and resolution of individual mirrors; for calibration and final alignment testing; for functional testing to determine final performance; and to calibrate x-ray instrumentation necessary for the development of the computer software required for the interpretation and analysis of the scientific and engineering data generated by the spacecraft.

In addition to supporting AXAF, the facility will also be used for calibration of rocket payloads for extreme ultraviolet and x-ray experiments, and for star tracker evaluations and calibrations. The enlarged instrument chamber will also provide an in-house capability at the Center to perform thermal vacuum tests on Space Shuttle payload experiments and to leak test large Space Station Freedom modules.

IMPACT OF DELAY:

Delay of this phase of the project would jeopardize the capability to conduct pre-launch "end to end" testing of the X-ray performance of the AXAF HRMA and SI's until such a time as it is completed. The XRCF is the only large X-ray optical test facility of its kind in the free world with the capability required by AXAF. Since HRMA and SI's calibration is on the project critical path, any delay in ground testing will result in increased cost and launch delays.

PROJECT DESCRIPTION:

Additional cryogenic pumps will be provided for the instrument chamber and the guide tube to increase the pumping capacity of their high vacuum systems. Additional cryogenic shrouds and heater panels will be installed to cover the cylindrical walls and the bottom of the instrument chamber. The pressurized, open-loop liquid nitrogen system will be modified to operate in subcooled, closed-loop, pumped mode. A 28,000 gallon storage tank, pumps, and distribution lines will be added to the liquid nitrogen system. The clean room will be upgraded from class 10.000 to a nominal class 100. An air deionizing system will be installed. A variety of modifications to improve laminar air flow conditions will be accomplished. A new chiller and cooling tower will be provided to meet temperature and humidity requirements in the clean room. Filtered, enclosed areas will be provided at all guide tube man-entry points to control contamination. Support workspace and clean room workstations will be provided with associated utilities support.

PROJECT COST ESTIMATE: Based on final design.

	Unit of Measure	Quantity	Unit cost	cost
<u>Construction.....</u>	---	---	---	<u>\$5,200,000</u>
Architectural/Structural	LS	---	---	509,500
Mechanical.	LS	---	---	4,690,500
Total.....				<u>\$5,200,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan Figure 2 - Artist Concept

OTHER EQUIPMENT SUMMARY:

Additional Research and Development funding in the amount of \$7,800,000 is required to complete this project .

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

**MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1992 ESTIMATES
MODIFICATIONS TO X-RAY CALIBRATION FACILITY**

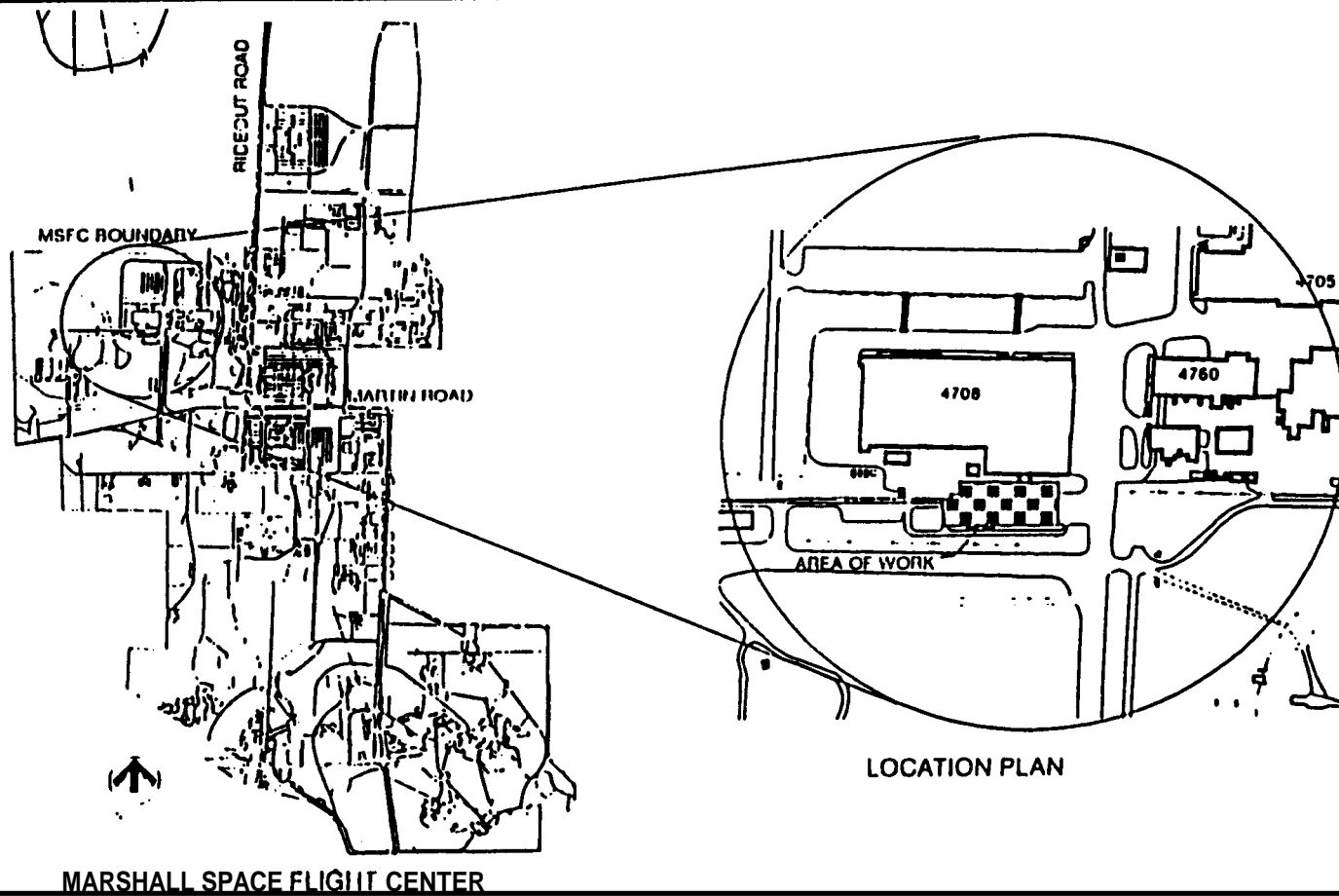


FIGURE 1

**MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1992 ESTIMATES
MODIFICATIONS TO X-RAY CALIBRATION FACILITY**

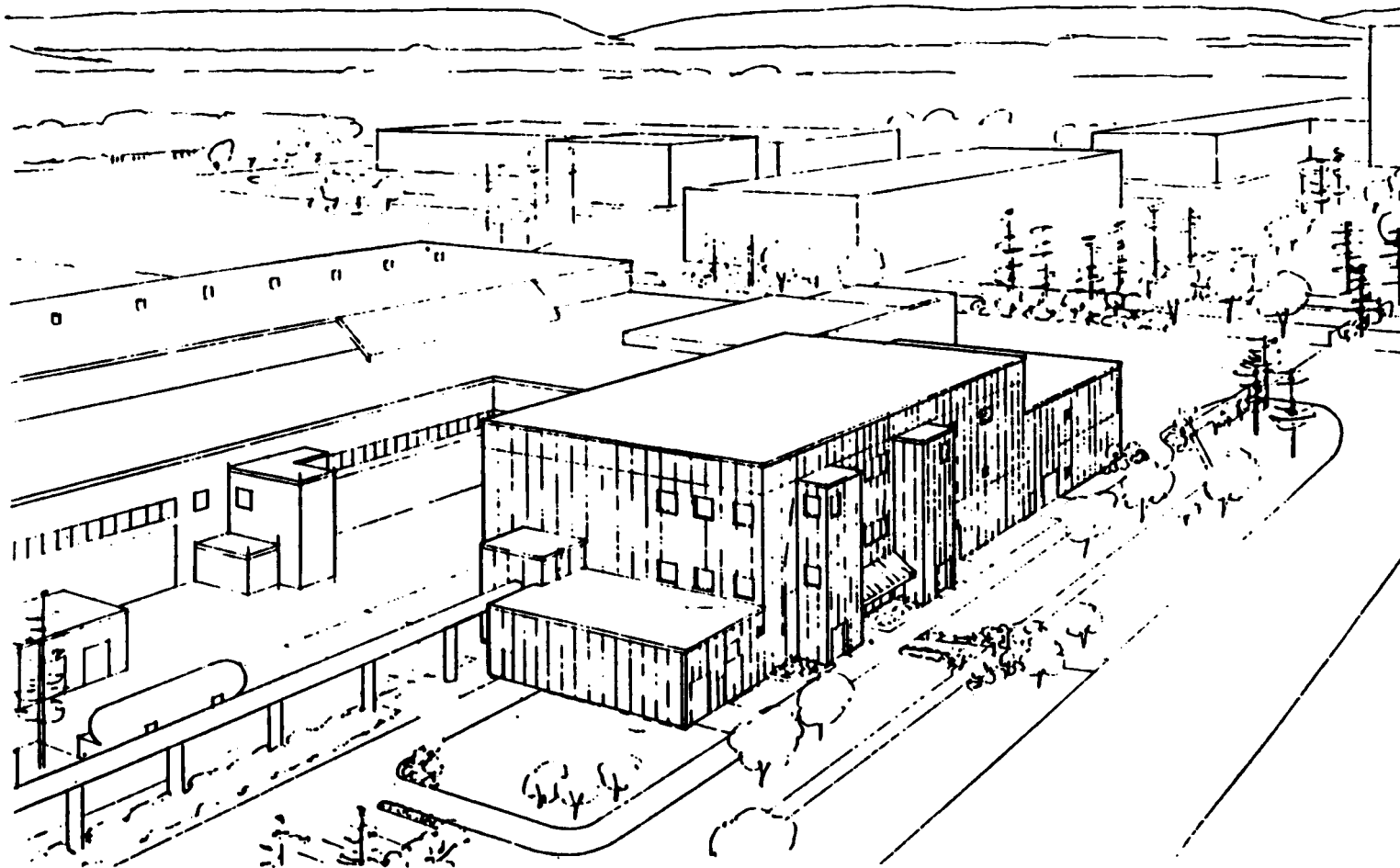


FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

GODDARD SPACE FLIGHT CENTER

	<u>Amount</u>	Page No.
Office of Space Science and Applications: -----	(Dollars)	
Restoration and Modernization of High Voltage Distribution System	7,000,000	CF 6-1
Construction of Earth Observing System Data Information System Facility..	17,000,000	CF 6-5

Total..	<u>24,000,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Restoration and Modernization of High Voltage Distribution System

INSTALLATION: Goddard Space Flight Center

FY 1992 CoF Estimate: \$7,000,000

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1991 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$660,000		\$ 660,000
Capitalized Investment.....		\$2,585,504	2,585,504
Total.....	<u>\$660,000</u>	<u>\$2,585,504</u>	<u>\$3,245,504</u>

SUMMARY PURPOSE AND SCOPE

This project provides for restoration and modernization of the high voltage electrical distribution system at the Goddard Space Flight Center (GSFC). The major objective of the project is to replace or upgrade the existing 4160 volt substation and 3/14 inch EMLD. This project work will replace old equipment, reduce maintenance costs and enhance the safety of the center-wide high voltage distribution system.

PROJECT JUSTIFICATION:

The present electrical distribution system is 30 years old and can no longer effectively support present and currently programmed GSFC operations. Growth in center electric power requirements, degradations due to age, and the gradual obsolescence of the original overall design scheme caused by changing needs and new construction have rendered the existing system ineffective. Through the years, additions and minor modifications to meet individual needs have resulted in a system that now requires major reconfiguration and renovation to restore operational flexibility and provide for future growth. Conversion of additional areas of the center to a 13.8-KV distribution system will increase efficiency and allow dedication of the 4160 volt

distribution system to critical loads which must be supported in exigent conditions with emergency generators. Conversion of above ground to underground feeders in selected locations will replace aging systems and make them less vulnerable to storm damage. Replacing the 4160 volt substation will further enhance the capacity, reliability and efficiency of this service to critical loads. This action will also eliminate obsolete equipment for which spare parts are becoming increasingly difficult to obtain. In addition, the transformers to be replaced are polychlorinated biphenyl (PCB) contaminated and replacement will eliminate a potential environmental hazard. This project will also increase the reliability and capacity of the electric power to the Building 3/14 complex which houses mission critical computing and communication equipment. Providing an additional 15MVA, 35KV-13.8KV transformer at the central substation is necessary to support currently programmed load growth at Goddard and to comply with utility load balancing requirements.

IMPACT OF DELAY:

Delay of this project will jeopardize the reliability and severely constrain the Goddard electrical distribution system. With several new facilities and additions scheduled, the existing feeders will be loaded to or exceed their rated capacity.

PROJECT DESCRIPTION

A. Reconfigure and Upgrade Electrical Feeders: 1) Reconfigure electrical feeders which provide power to the Building 3/14 complex and Building 8/14 Operations Center (DOF). New feeders will be provided for the Building 7/10/15/29. Two new 3 switchgear will be added to the existing line-up to support the new feeders. The feeders will be reconfigured to balance the loads on each feeder. The feeders which serve Building 28/DOF will be replaced with new 13.8KV feeders. 2) The 13.8KV and 13.8KV will be replaced with 13.8KV. Replace the 5KV transformer with a 13.8KV primary transformer for Building 20 and new 13.8-KV feeders will be provided to Building 18, 1 and 20. 3) Area 14 and Area 14 will be replaced with new 13.8-KV underground feeders. Existing feeders which serve these outlying sites will be replaced with new 13.8-KV underground feeders.

B. Replace 4160 Volt Substation: Items included in this project are two 3750KVA 16KV transformers and associated equipment to replace existing equipment. The new transformer will be provided to take power from a new Otomac Electric Power Company 35-KV feeder. The existing substation and associated equipment will be modified as required to accommodate the added equipment.

C. Buildings 3/14 Electrical Upgrades: Items include replacement of existing load center with a 1000-KVA, 480 volt-120/208 volt technical loadcenter for Building 14. The loadcenter will be located in the existing area of Building 14. This project also includes: 1) The replacement of two 1000-KVA updatable power supply units in Building 14; 2) the replacement of two 1000-KVA transfer switches and main circuit breakers in the shelter area of Building 14; 3) including replacement of obsolete equipment.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>Cost</u>
<u>Construction.....</u>	---	---	---	<u>\$7,000,000</u>
Reconfigure/Replace Electrical Feeders.....	LS	---	---	2,000,000
Replace 4160 Volt Substation.....	LS	---	---	3,000,000
Building 3/14 Electrical Upgrades.....	LS	---	---	2,000,000
Total.....				<u>\$7,000,000</u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1992 ESTIMATES
RESTORATION AND MODERNIZATION OF HIGH VOLTAGE DISTRIBUTION SYSTEM

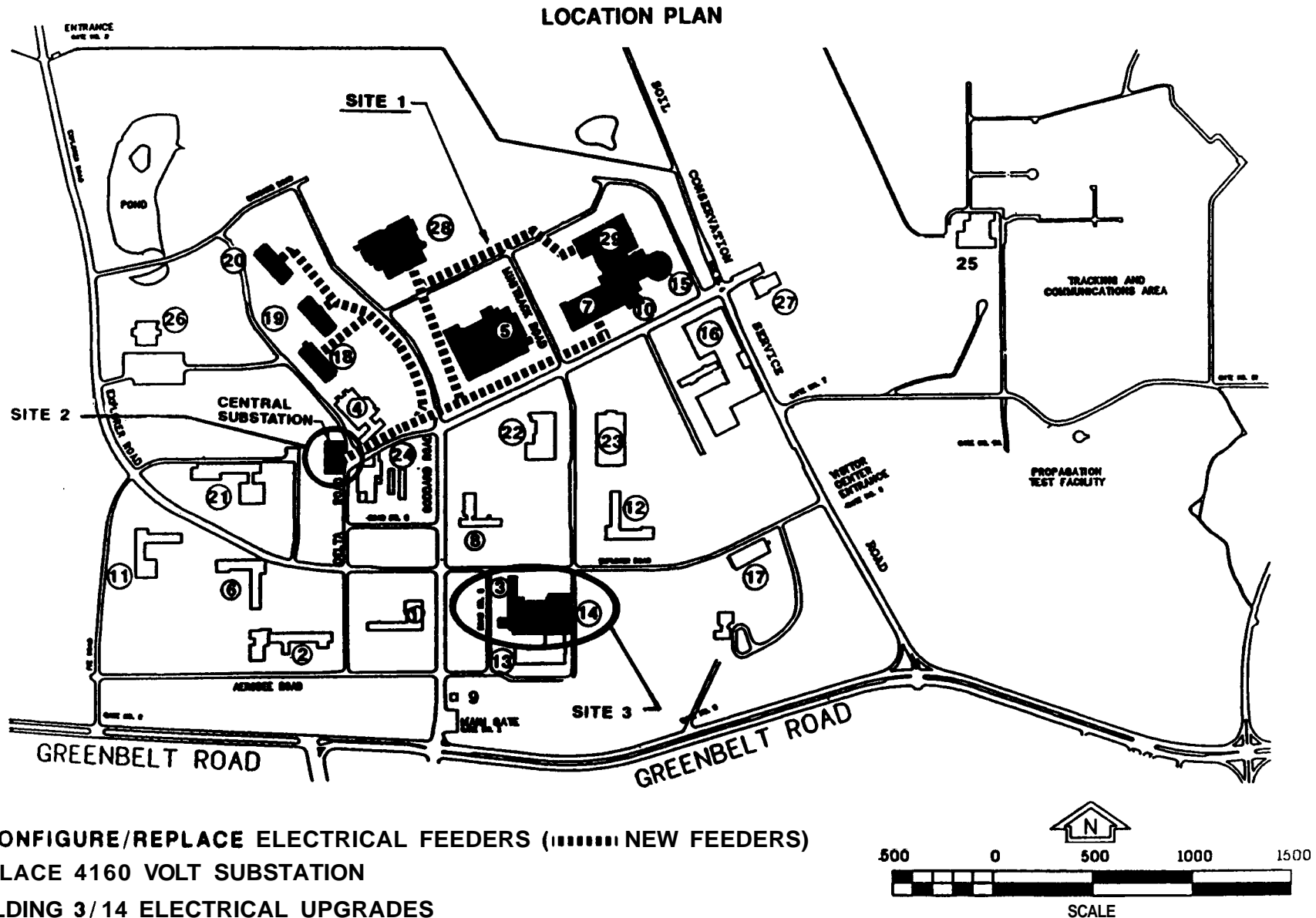


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Construction of Earth Observing System Data Information System Facility

INSTALLATION: Goddard Space Flight Center

FY 1992 CoF Estimate: **\$17,000,000**

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project.

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	<u>33,810,000</u>	<u>\$8,000,000</u>	<u>\$11,810,000</u>
Capitalized Investment.....		<u>---</u>	<u>---</u>
Total.....	<u>33,810,000</u>	<u>\$8,000,000</u>	<u>\$11,810,000</u>

SUMMARY PURPOSE AND SCOPE

This is the second phase of construction of a Earth Observing System Data Information System (EOSDIS) facility at the Goddard Space Flight Center. It will add 190,000 square feet of space to house the data recording and processing (ADPE) and telecommunications facilities, and will require to maintain a permanent, recording and transmission capability in support of the EOS Program. The final increment to complete the facility is scheduled for 1993.

PROJECT JUSTIFICATION:

The Earth Observing System (EOS) program anticipates the cooperative involvement of the United States, the European Space Agency (ESA), and the Japanese National Space Development Agency (NASDA). The United States' portion of the program will be implemented by NASA in cooperation with the National Oceanic and Atmospheric Administration (NOAA). The EOS program will support observation of the Earth from space using unmanned platforms. These platforms will be equipped with remote sensing instruments and will be launched into a polar

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orbit to facilitate viewing of all parts of the globe. The measurements obtained from these observations will constitute a 15 year data set, which will be used by scientists to construct and test models and theories about global environmental interactions. Information resulting from the EOS Program will contribute to an understanding of the consequences of human activity on the environment, and aid in predicting the impact of man-made and natural environmental events. This information will provide world leaders and policy makers with the information needed to make timely and informed decisions which will help to preserve the habitability of the global ecosystem. Currently no facility or system exists within NASA or the world scientific community that is capable of supporting the data processing and storage requirements of EOS. Construction of a new facility for the EOSDIS is the only viable alternative for providing the required level of EOS support. The magnitude of the facilities requirement precludes the recovery and reuse of existing GSFC space, and the costs and inefficiencies associated with leasing off-Center space for a program of this magnitude and longevity would be excessive.

Completion of the facility is required in 1994 to support the installation of associated ADPE and subsequent component software development, installation, debugging, and Data Operations System (DOS)/EOS interface testing prior to launch of the first space platform in the late 1990's. In addition, the facility is required to support end-to-end integration, and integration of space platform instruments, as well as operational training prior to the pre-launch freeze for the first space platform launch.

IMPACT OF DELAY:

If construction of the EOSDIS facility is delayed, it will be necessary to delay the acquisition and installation of the EOS data system which will have an adverse impact on the implementation of the EOS program.

PROJECT DESCRIPTION:

This project will provide the second increment of construction for the 190,000-square-foot facility located east of Soil Conservation Service Road and north of Greenbelt Road. This continues the sitework and includes the construction of the utility plant building, utility tunnel and chilled water piping. Also included is the construction of the EOSDIS building foundations, shell and primary interior electrical distribution.

The facility will consist of a combination multi-story steel and concrete structure. Exterior finish materials will consist of masonry, glass and aluminum, and/or precast concrete panels, in keeping with materials used elsewhere on Center. Interior finishes include raised flooring in ADPE area, heating, ventilation, and air conditioning systems, fire protection and detection systems. Interior and exterior lighting, electrical power, building security systems and a uninterruptible electrical system will be provided. Necessary provisions for domestic water, sanitary sewer, steam, and telephone and communications duct banks will also be provided. Construction of access roads, necessary parking, sidewalks, curbs and gutters, site lighting, landscaping, security fencing, electrical substation, and chilled water plant are also included.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction..</u>	---	---	---	<u>\$17,000,000</u>
Utility Plant Building	LS	---	---	6,600,000
Tunnel With Piping	LS	---	---	900,000
Chilled Water Piping	LS	---	---	2,200,000
EOSDIS Building	SF	190,000	38.42	7,300,000
Foundation....	SF	190,000	8.42	(1,600,000)
Superstructure (Shell).....	SF	190,000	21.58	(4,100,000)
Electrical.....	SF	190,000	8.42	(1,600,000)
Total.....				<u>\$17,000,000</u>

Note: This cost estimate provides for the FY 1992 increment of the total facility. The FY 1991 first increment was \$8,000,000. The total cost of the project is estimated to be approximately \$42,000,000.

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

OTHER EQUIPMENT SUMMARY:

Approximately \$500,000,000 of Research and Development funded ADPE to support data processing, information management and data archiving requirements will be required for this facility.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

To complete this project, a third increment is required in the FY 1993 budget at \$17,000,000.

**GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF EARTH OBSERVING SYSTEM DATA INFORMATION SYSTEM FACILITY**

LOCATION PLAN

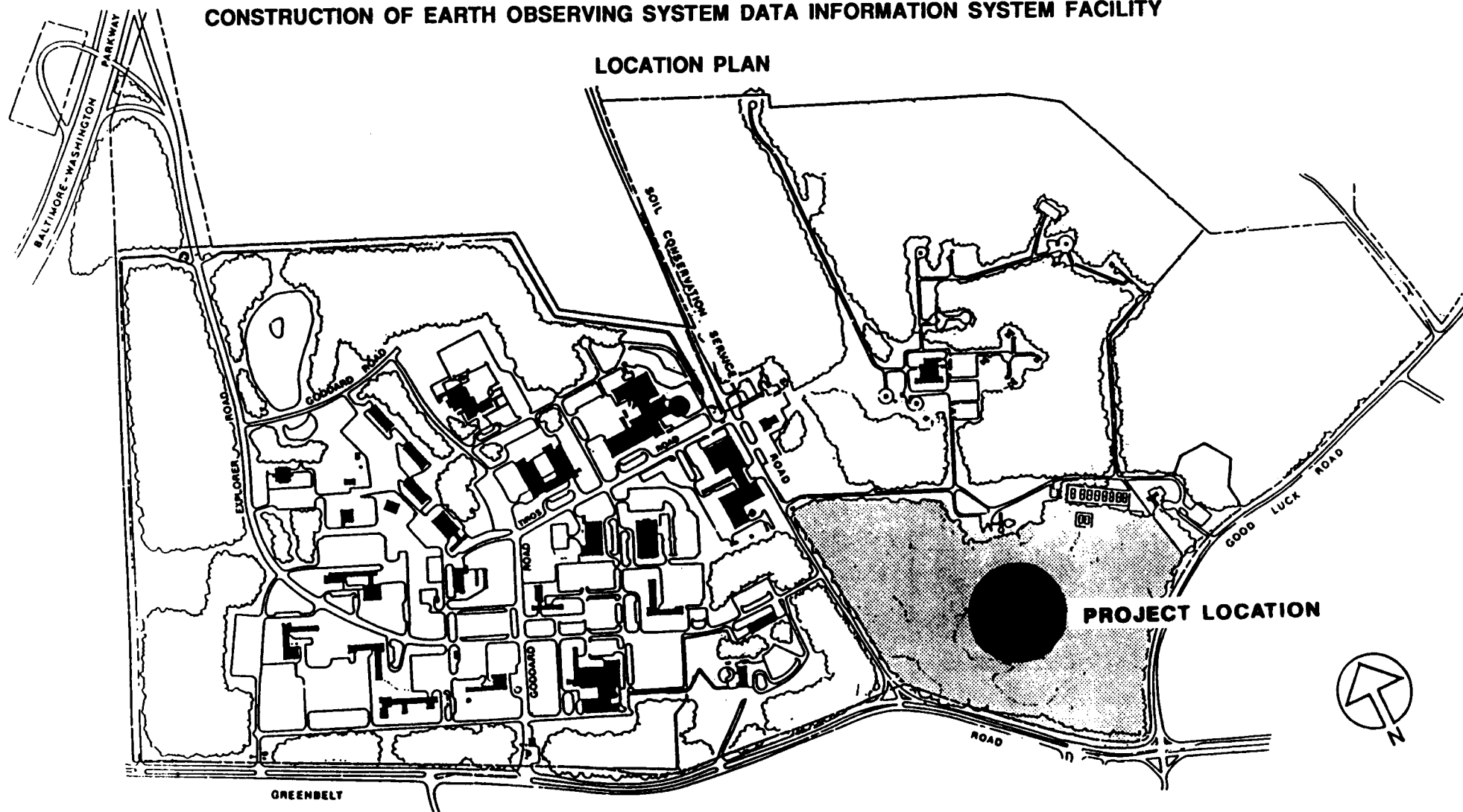


FIGURE 1

JET PROPULSION
LABORATORY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

JET PROPULSION LABORATORY

	Amount ----- (Dollars)	Page No. -----
Office of Space Science and Applications: -----		
Modernization of Main Electrical Substation.	5,500,000	CF 7-1

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modernization of Main Electrical Substation

INSTALLATION: Jet Propulsion Laboratory

FY 1992 CoF Estimate: ' \$5,500,000

LOCATION OF PROJECT: La Canada-Flintridge, Los Angeles County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	<u>\$25,000</u>		<u>\$ 25,000</u>
Capitalized Investment.....	<u>---</u>	<u>\$5,855,495</u>	<u>\$ 5,855,495</u>
Total.....	<u>\$25,000</u>	<u>\$5,855,495</u>	<u>\$5,880,495</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the moderization of the Jet Propulsion Laboratory's (JPL) main electrical substation "G" to increase reliability. Increasing the primary service voltage from 16 kV to 66 kV from Southern California Edison (SCE) will also permit a more economical power tariff.

PROJECT JUSTIFICATION:

This project provides for redundancy in service to increase reliability, minimize the possibility of a major power failure, and provide for future load growth. At present, JPL receives power from two metering points, one at 16 kV and one at 66 kV. By receiving service from SCE at 66 kV only, JPL would qualify for a lower tariff rate. An estimated gross savings of \$1.1 million per year could be realized by accepting service at 66 kV based on JPL's actual 1988 load profile resulting in a 5-year simple payback of this investment.

IMPACT OF DELAY:

The present configuration of substation "G" is not reliable and has resulted in past power failure. The possibility of a major power failure will exist until the configuration of substation "G" is changed. Also, the estimated cost savings of \$1.1 million per year would not be realized.

PROJECT DESCRIPTION:

A new double-ended substation comprised of two transformers and a 10-line position metal clad switchgear will be constructed. The two transformers would be sized at a rating of 16.8/22.4 MVA, 3 Phase, 66 kV primary and 16 kV secondary. The 10-line position metal clad switchgear would be provided with 2000 amperes busbar, a tie-breaker and five distribution breakers on either side of the tie-breaker. Two separate 66 kV underground incoming source lines will furnish power to the transformers from the adjoining Arroyo substation of the Southern California Edison Company. The 16 kV power feeders from the metal clad switchgear will be connected to the Laboratory's existing power distribution network. This operation will be done in phases, so that electrical service to all the facilities in the Laboratory would be maintained during construction. Underground conduits from five spare distribution breakers in the metal clad switchgear to new manholes would also be installed at this time to enable easy access to the spare circuits for future use. All existing unused equipment will be removed.

PROJECT COST ESTIMATE: This cost estimate is based on preliminary design.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$5,500,000</u>
Substation Modifications.....	LS	---	---	5,500,000
Total.....				<u>\$5,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan Figure 2 - Site Plan

FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

**JET PROPULSION LABORATORY
FISCAL YEAR 1992 ESTIMATES
MODERNIZATION OF MAIN ELECTRICAL SUBSTATION**

LOCATION PLAN

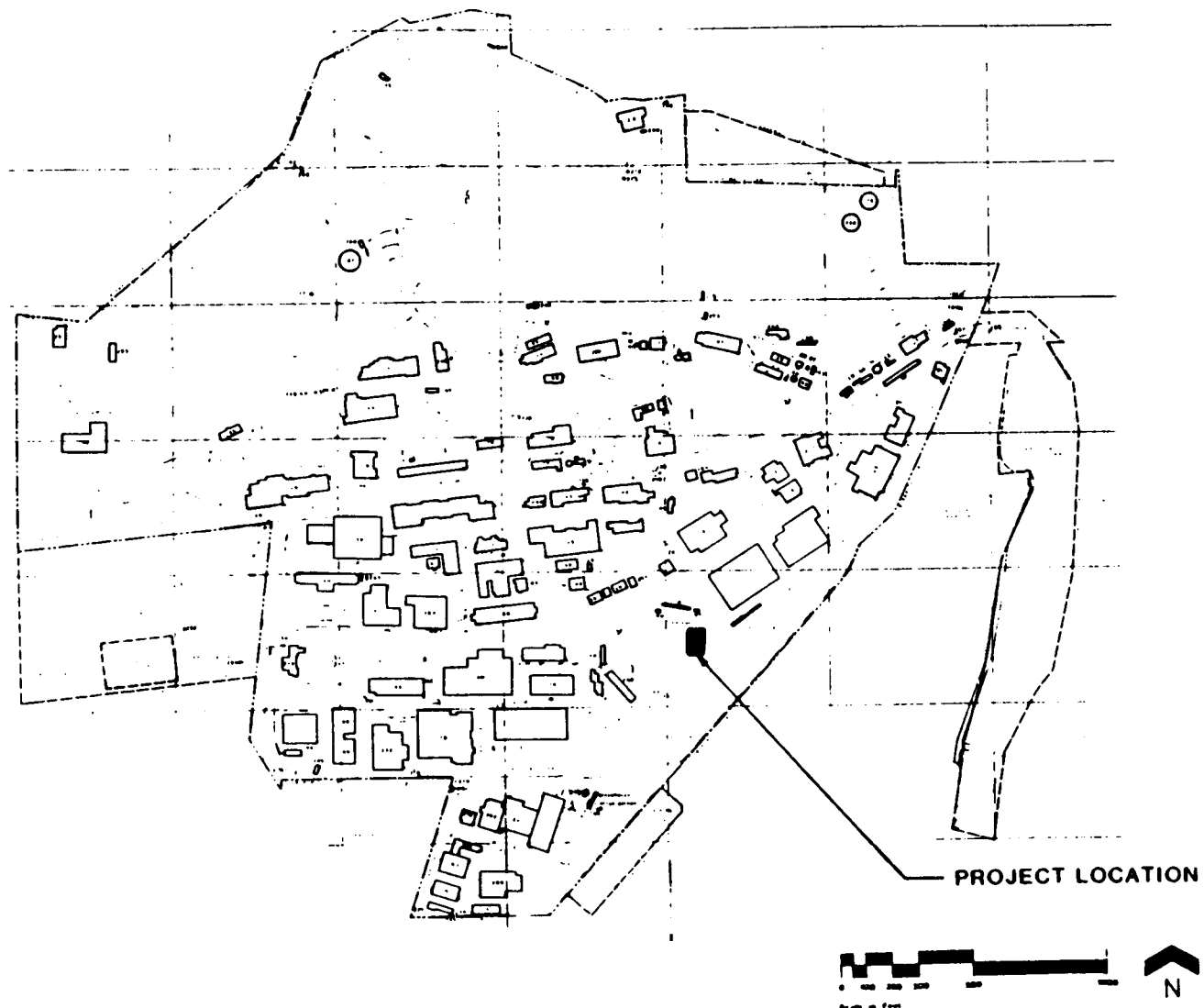


FIGURE 1

**JET PROPULSION LABORATORY
FISCAL YEAR 1992 ESTIMATES
MODERNIZATION OF MAIN ELECTRICAL SUBSTATION**

SITE PLAN

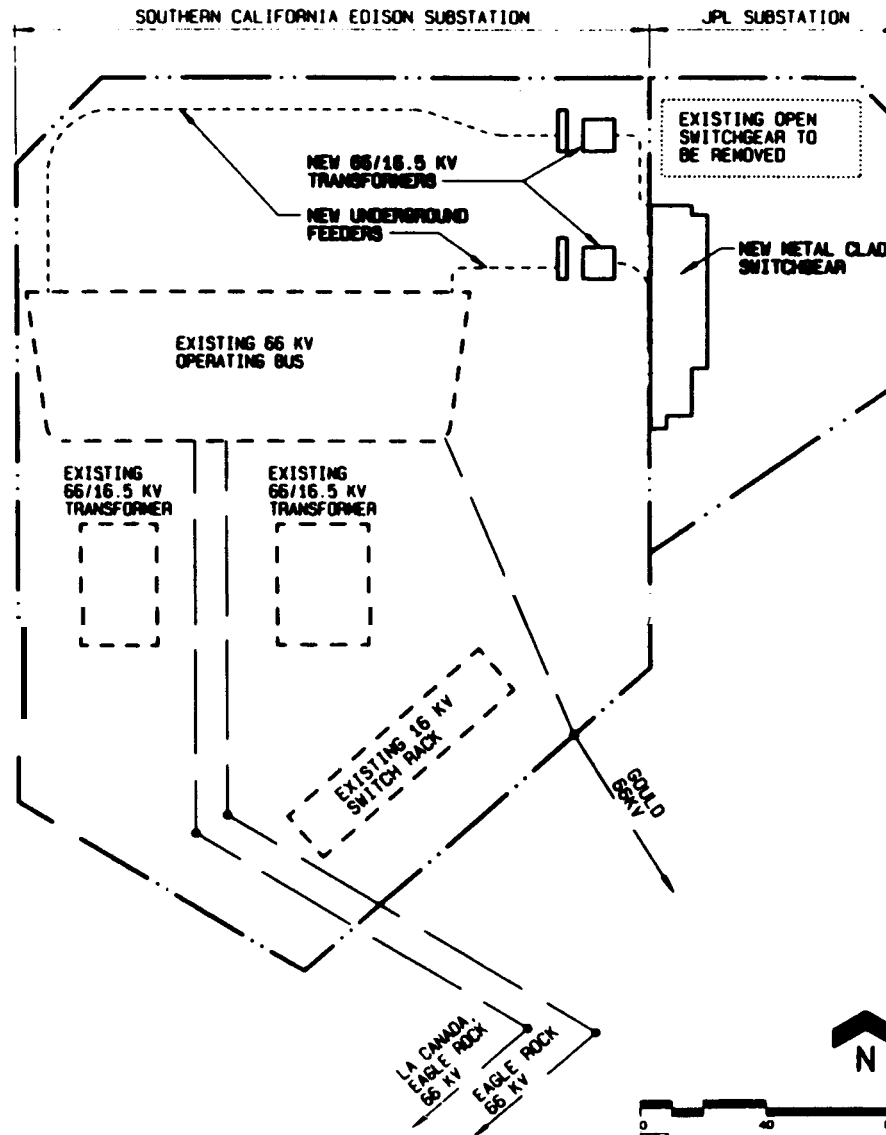


FIGURE 2

WALLOPS FLIGHT
FACILITY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

Wallops Flight Facility

	Amount	Page
	-----	No.
	(Dollars)	-----
Office of Space Science and Applications: -----		
Restoration of Utilities	3,500,000	CF 8-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Restoration of Utilities

INSTALLATION: Wallops Flight Facility

FY 1992 CoF Estimate: \$3,500,000

LOCATION OF PROJECT: Wallops Flight Facility, Wallops Island, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to **this** project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$612,452	\$ 5,200,000	\$ 5,812,452
Capitalized Investment.....	<u>---</u>	<u>11,281,499</u>	<u>11,281,499</u>
Total.....	<u>\$612,452</u>	<u>\$16,481,492</u>	<u>\$17,093,951</u>

SUMMARY PURPOSE AND SCOPE:

This project continues the restoration of utility systems (water, sewer, electrical distribution and storm drainage) at the Wallops Flight Facility. The project will replace very old, deteriorated systems, enhance system reliability, and reduce operation and maintenance costs.

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PROJECT JUSTIFICATION:

Restoration of the water system is necessary to improve fire protection water supplies and to conform with State Health Department standards for domestic water supplies.

The restoration of the Main Base and Island sewer systems will reduce the potential of water and environmental pollution, and reduce the operation and maintenance costs. Restoration will also provide for compliance with federal and state rules and regulations and a higher level of health protection for all personnel.

Replacement the electrical equipment on Wallops Island is necessary because the existing equipment is from 20 to 40 years old, has reached the end of its useful life and is breaking down with increasing frequency. The overhead lines to be replaced are experiencing outages due to deterioration with age. This electrical system distributes approximately 3 million kilowatt hours of electrical power to the buildings, radar, computers, and rocket launching equipment on Wallops Island and the Main Base each month and frequent electrical outages are disrupting scheduled operations.

The storm drainage system work **is** required to repair deteriorated storm drains and to correct drainage deficiencies resulting from facility changes over the past 40 years. Minimal work has been performed to correct problems **or** modernize the system, and **it** has become ineffective in areas. In addition, the storm drainage system is a source of erosion problems due to pipe separations.

IMPACT OF DELAY:

Delay of this project will force continued use of utility systems which have severely deteriorated with **age**; no longer **meet** health, safety and environmental regulations; are unreliable; and do not adequately support Wallops activities **or** fire protection requirements. The deterioration of the systems **is** such that the risk of electrical outages **or** pipe ruptures **is** at an unacceptable level and **may** cause mission delays; undermining of airfield **or** road pavements; **or** discharge of untreated sewage to the environment.

PROJECT DESCRIPTION:

This project provides for the following: replacement of the Main Base raw water treatment system; replacement of elevated storage tank V-90 on Wallops Island; installation of 3,500 linear feet of 14-inch water main on Main Base; replacement of 7,000 linear feet, and sealing or lining of 7,500 linear feet of sewer lines on Main Base and Wallops Island; improvements to the sewage collection systems between Wallops Island and Main Base; the installation of voltage regulators on the Main Base; the replacement of 7 transformers on Main Base; replacement of 7,000 linear feet of 13,000 volt overhead service with underground service on Main Base and Wallops Island: and the repair of 45,000 linear feet of 8-inch to 54-inch diameter storm drainage piping on Main Base.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$3,500,000</u>
Water.....	LS	---	---	850,000
Sanitary Sewer.....	LS	---	---	500,000
Sewage Collection System Improvements.....	LS	---	---	500,000
Electrical.....	LS	---	---	950,000
Storm Drainage.....	LS	---	---	<u>700,000</u>
Total.....				<u>\$3,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan Figure 2 - Main Base Site Plan
 Figure 3 - Wallops Island Site Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

WALLOPS FLIGHT FACILITY
FISCAL YEAR 1992 ESTIMATES
RESTORATION OF UTILITIES

LOCATION PLAN

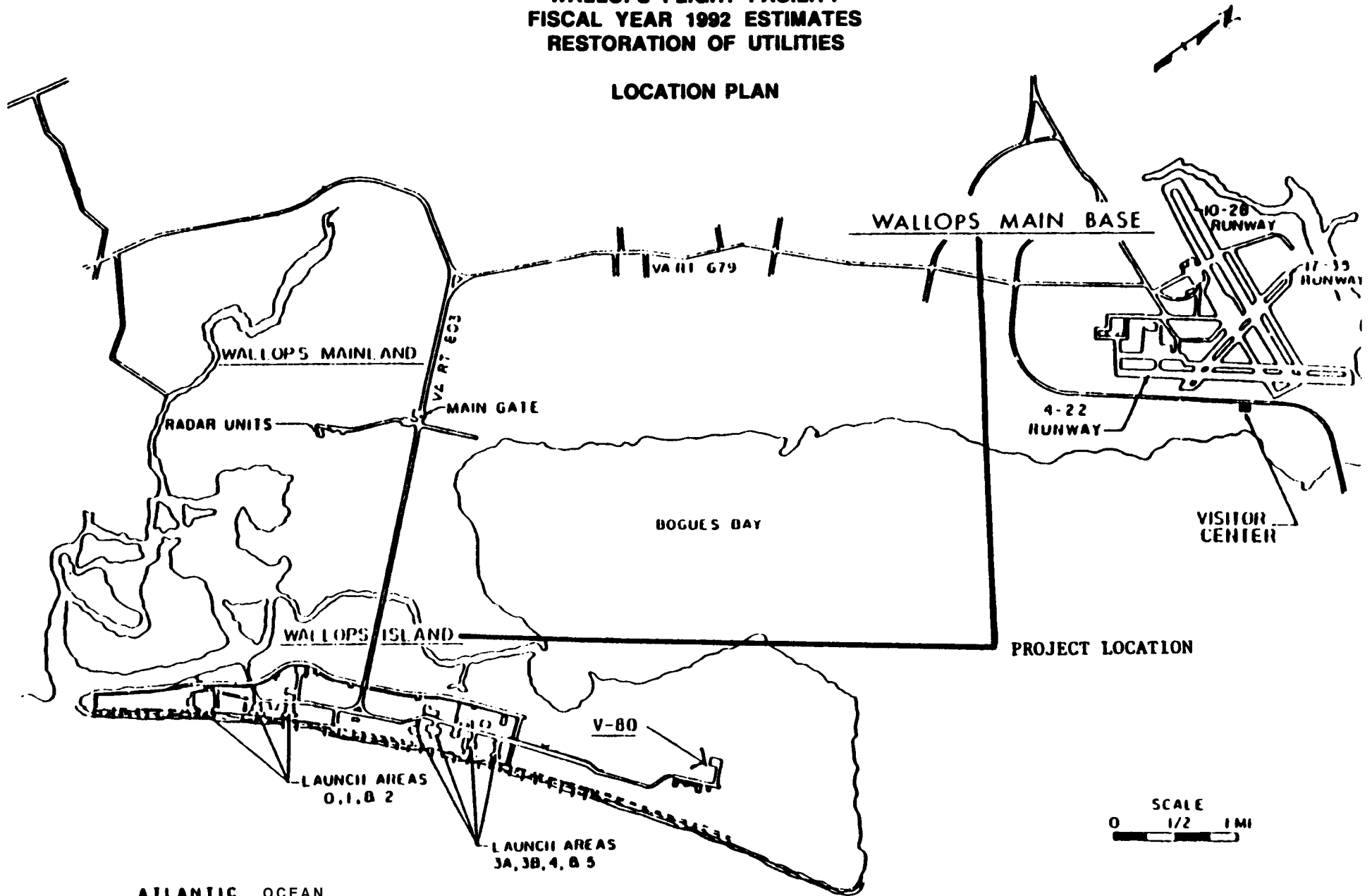


FIGURE 1

**WALLOPS FLIGHT FACILITY
FISCAL YEAR 1992 ESTIMATES
RESTORATION OF UTILITIES**

MAIN BASE

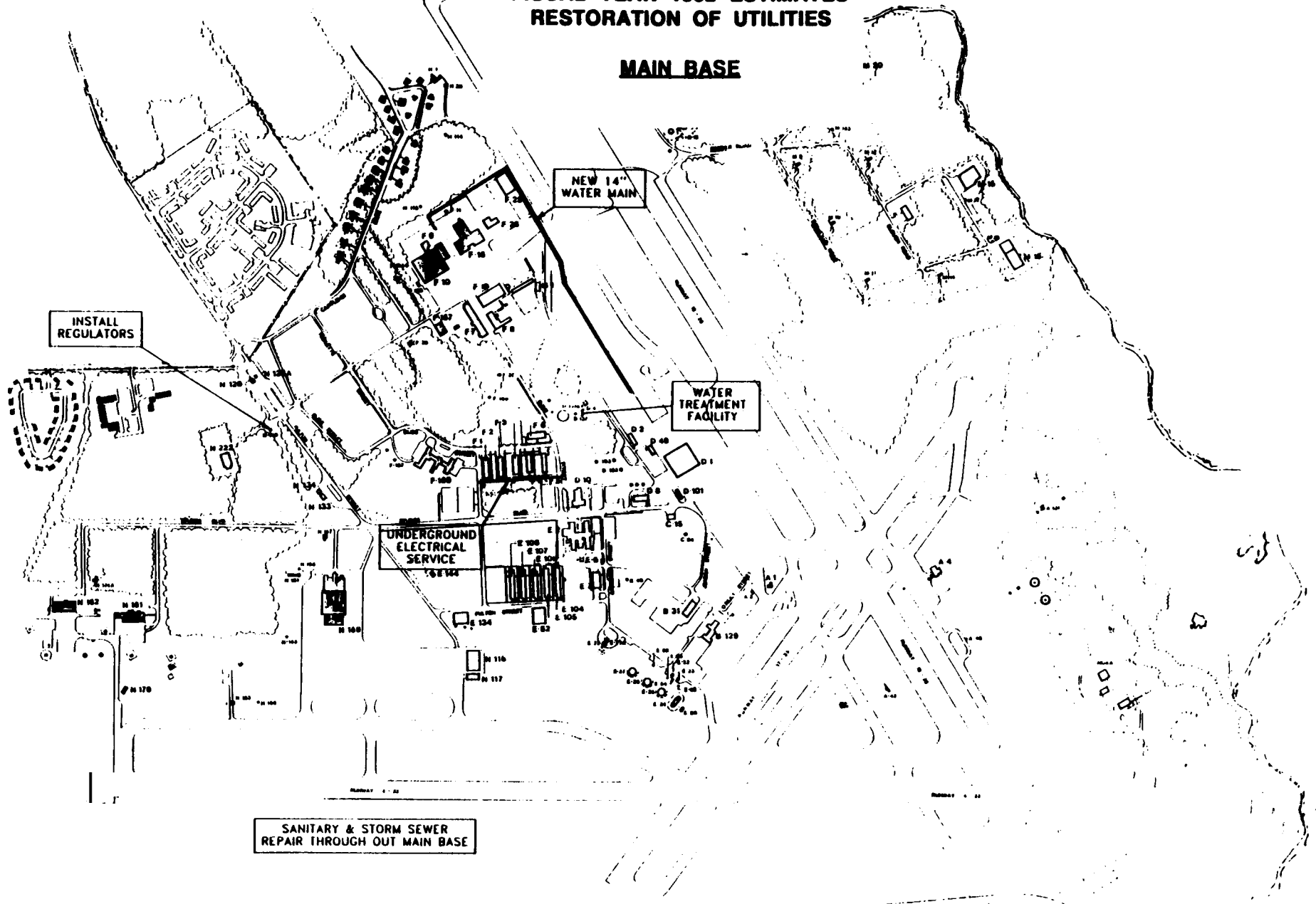


FIGURE 2

WALLOPS FLIGHT FACILITY
FISCAL YEAR 1992 ESTIMATES
RESTORATION OF UTILITIES

WALLOPS ISLAND

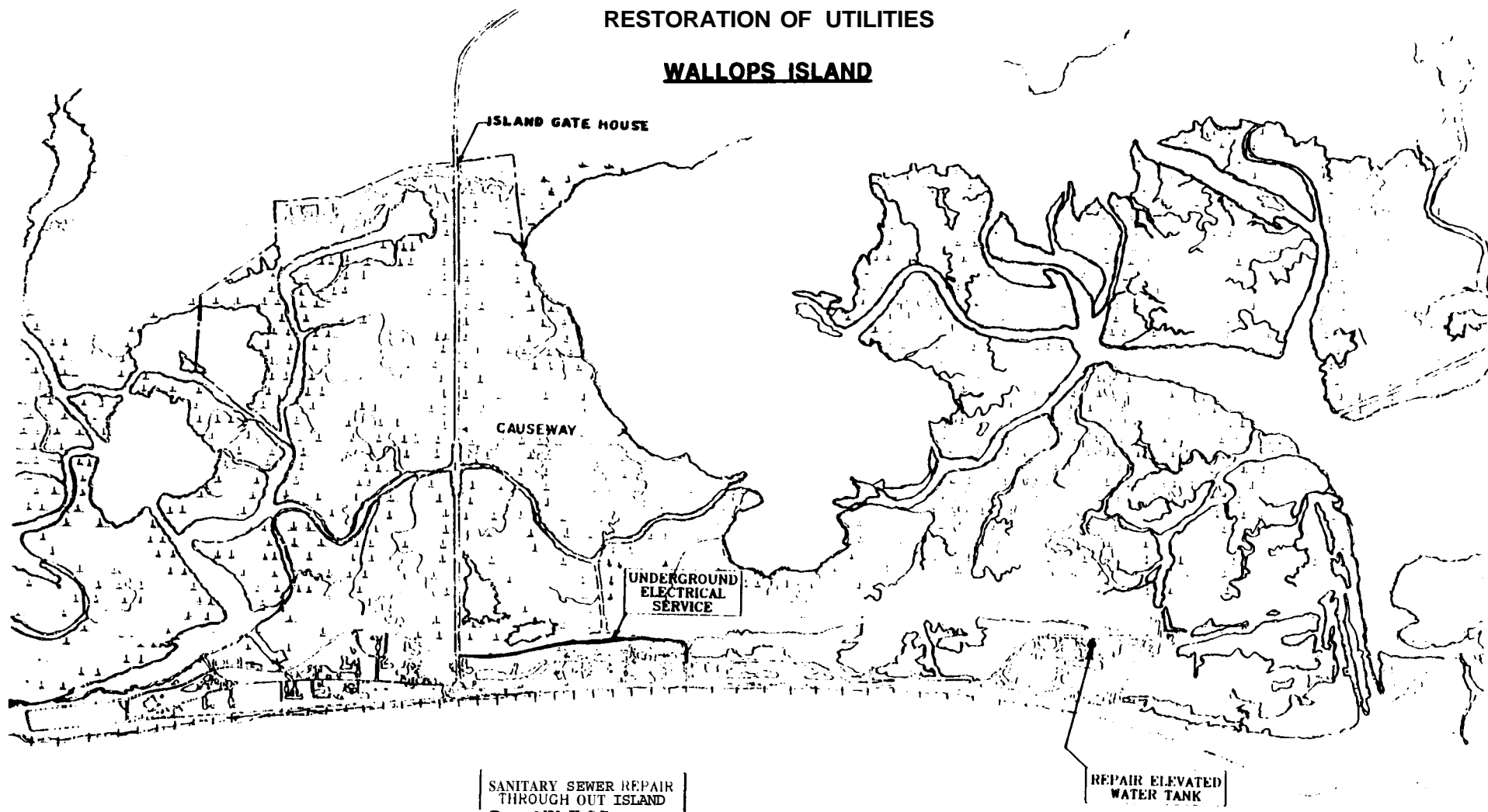


FIGURE 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

AERONAUTICAL FACILITIES REVITALIZATION

	Amount ----- (Dollars)	Page No. -----
Office of Aeronautics and Space Technology: -----		
Upgrade of Outdoor Aerodynamic Research Facility, Ames Research Center.....	3,300,000	CF 9-1
Modernization of 16-Foot Transonic Tunnel, Langley Research Center.....	3,400,000	CF 9-6
Rehabilitation of Icing Research Tunnel, Lewis Research Center.....	2,600,000	CF 9-10
Modifications to the High Pressure Air System, Langley Research Center.....	11,700,000	CF 9-14
Repair and Modernization of the 12-Foot Pressure Wind Tunnel, Ames Research Center.....	25,000,000	CF 9-18
Rehabilitation of Central Air System, Lewis Research Center.....	5,600,000 -----	CF 9-23
 Total.	 <u>51,600,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR **1992** ESTIMATES

PROJECT TITLE: Upgrade of Outdoor Aerodynamic Research Facility

INSTALLATION: Ames Research Center

FY 1992 CoF Estimate: **\$3,300,000**

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration, and Technology

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	<u>\$222,693</u>	---	<u>\$ 222,693</u>
Capitalized Investment.....	---	<u>\$19,985,787</u>	<u>19,985,787</u>
Total.....	<u>\$222,693</u>	<u>\$19,985,787</u>	<u>\$20,208,480</u>

SUMMARY PURPOSE AND SCOPE:

This project enlarges the Outdoor Aerodynamic Research Facility (OARF) **N-249**, at Ames Research Center's Moffett Field site to support testing of models and aircraft sized for the **80 x 120 foot** leg of the National Full-scale Aerodynamics Complex (NFAC). The work includes an enlarged model support system; modification of the existing concrete pit and model support framework; development of large-model accessways to the facility; and modification of the storm water drainage system.

PROJEC JUSTIFICATION:

This project is necessary to increase the testing capabilities of the Outdoor Aerodynamic Research Facility in support of the 80 x 120 foot leg of the NFAC. The proposed improvements will enable the OARF to accommodate large models and aircraft scheduled for testing in the 80 X 120 foot leg of the NFAC. The checkout of these models in the OARF will free the 80 x 120 foot leg for other aeronautical testing during model preparation. The OARF has been used for many years to evaluate models and aircraft entering the 40 X 80 foot leg of the NFAC. Hundreds of valuable wind tunnel occupancy hours have been saved by discovering and correcting faulty test hardware prior to using the 40 X 80 tunnel test section. In a similar manner, by increasing the size of the OARF to accommodate models sized for the 80 x 120 foot test section, valuable tunnel time in this leg can also be saved. Currently, large models or aircraft must be checked out in the 80 x 120 wind tunnel itself. This practice increases the time required for each test: limits the number of scheduled test runs: and increases the backlog of other tests because of lowered productivity.

Engine checkouts must also be performed in the tunnel test section, further reducing time available for actual testing and increasing hazards to personnel and the tunnel due to an increased time for presence of fuels in the tunnel and risk of engine failures in unchecked engines. Enhancement of the capability of the Outdoor Aerodynamic Research Facility will reduce the backlog, improve utilization of the 80 X 120 foot wind tunnel, and will improve safety by allowing engine checkouts outdoors.

IMPACT OF DELAY:

Model checkout operations and engine checkout will continue to be performed in the test section of the 80 X 120 foot wind tunnel. Continuation of the current approach to model checkout will limit the availability of a unique test facility. Such a delay will result in continuing backlogs in availability of this facility for national aeronautics testing programs.

ROJECT DESCRIPTION:

The project includes a new model support system consisting of two main struts and one tail strut. The proposed load carrying capability will be +/- 150,000 lbs vertical load or lift, +/- 50,000 lbs longitudinal thrust, and +/- 30,000 lbs side force. Tread width and tail length will be adjustable by locally controlled electric motors. The tail strut will be adjustable to provide a +/- 10 degree pitch range. A concrete pit will be constructed to accomodate the increased tread and tail width requirements of the model support struts and recess all model support mechanisms below grade. An access road will be provided from the test section of the 80 x 120 leg of the NFAC to the OARF. Finally, the storm drainage system will be modified to drain the concrete pit and model support system area to an existing oil-water separator.

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PROJECT COST ESTIMATE:

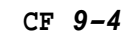
	<u>Unit of</u> <u>Measure</u>	<u>Quantity</u>	<u>Unit</u> <u>cost</u>	<u>cost</u>
<u>Construction.....</u>				<u>\$3,300,000</u>
Roadways.....	LS	---	---	754,000
Foundation and Pit.....	LS	---	---	800,000
Model Support.....	LS	---	---	1,116,000
Model Services.....	LS	---	---	193,000
Electrical.....	LS	---	---	<u>437,000</u>
Total.....				<u>\$3,300,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Schematic

OTHER EQUIPMENT SUMMARY: Existing main struts and ball joints will be provided as Government-furnished equipment.

FUTURE ESTIMATED CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

FACILITY



AMES RESE
FISCAL YEAR 1 ESTIMATES
E OF DOOR AERODYNAMIC RESEARCH FACILITY

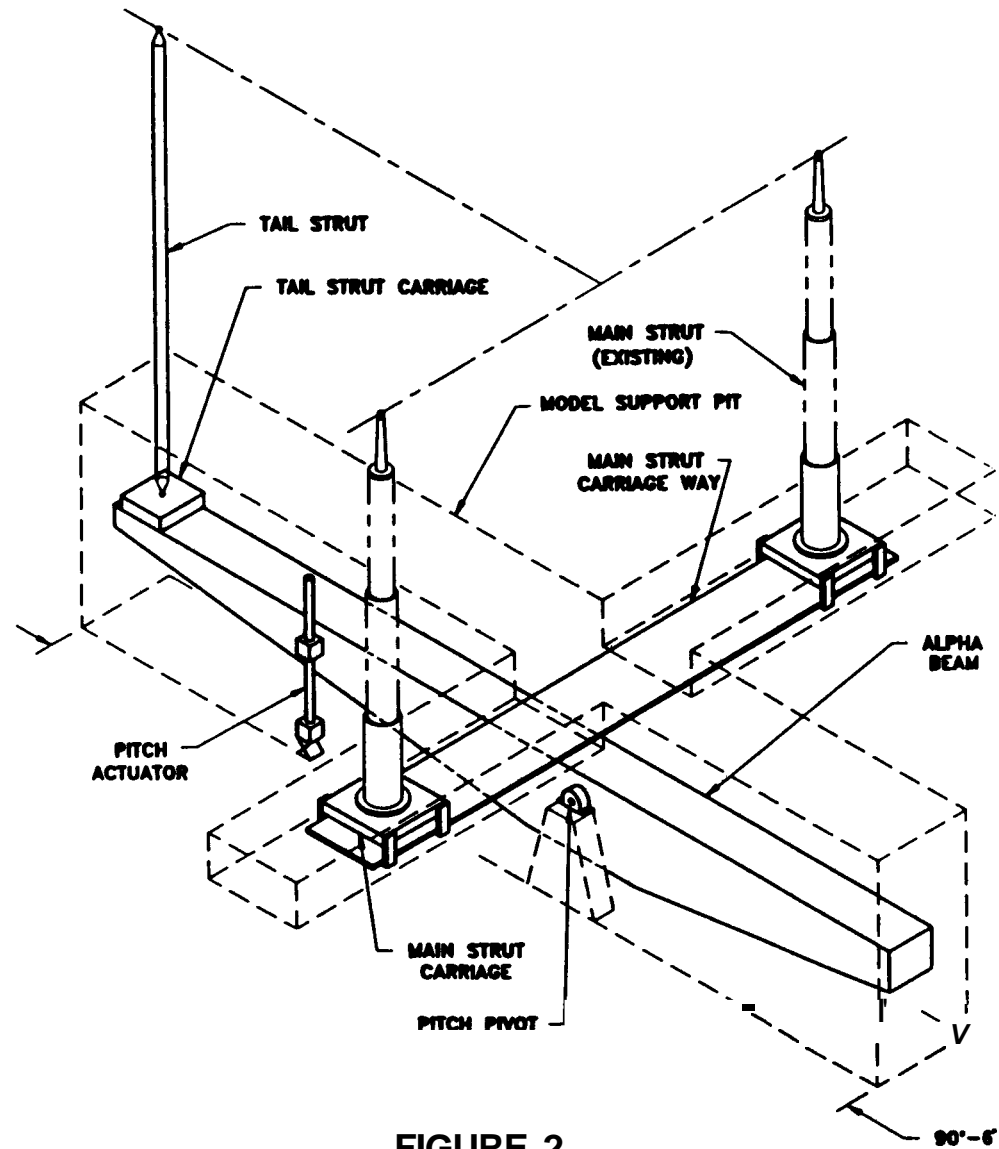


FIGURE 2
SCHEMATIC

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modernization of 16-Foot Transonic Tunnel

INSTALLATION: Langley Research Center

FY 1992 CoF Estimate: \$3,400,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration and Technology

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$376,000	---	\$ 376,000
Capitalized Investment.....	---	<u>\$25,097,878</u>	<u>25,097,878</u>
Total.....	<u>\$376,000</u>	<u>\$25,097,878</u>	<u>\$25,473,878</u>

SUMMARY URF AND SCOPE:

This project is part of the NASA Aeronautical Facilities Revitalization program. The project will increase tunnel productivity significantly and provide increased model propulsion air flow to satisfy research and development testing of dual flow exhaust system integration for subsonic transports; and for high speed transports that have dual exhaust streams for noise abatement. The project also includes refurbishment of the deteriorated air exchange tower, tunnel components, and an addition to the building for personnel and model preparation work.

PROJECT JUSTIFICATION:

The 16-Foot Trans Tunnel is a large transonic facility used to research. The enhanced facilities structural refurbishment, and increased integration are required because:
1) a huge backlog of test requests for the 16 Transonic tunnel requires improvement in capability to reduce the time required for tests; (2) an increased emphasis on dual flow testing for advanced aircraft has created a new and increasing demand for an additional high power air system to conduct research which is beyond the capability of the current system; and (3) the large increase in tests will create a need for additional data analysis space, and model storage area.

IMPACT OF DELAY:

Delay of this project will prolong and exacerbate the large backlog of test requests and research programs focused on optimizing the integration of advanced engine/airframe systems of this Nation's future in aeronautics.

PROJECT DESCRIPTION:

This project includes the following: 1) Drive Motor Cooling - Additional cooling to increase the run time before temperature limits are exceeded. The system will include pumps, interconnecting piping, heat transfer coils, and controls; 2) Additional Propulsion High Mass-Flow System - Additional propulsion simulation system for dual air flow simulation will consist of an independent air source which will include a new pressure reducing station, valves, filters, controls, and piping capable of continuous flow at a maximum mass flow rate of 30 lb/sec at 1800 psi; 3) Refurbishment of Air Exchange Tower and Tunnel Components - Repairs metal surfaces on the intake and exhaust vanes, recoats inner walls of the exhaust tower, replaces the cable mechanism of the exhaust vanes actuator, and repairs and replaces tunnel bolting; and 4) Addition to Building 1146 - Existing capabilities for propulsion integration data analysis will be upgraded by adding a 6900 gross square feet to Building 1146 consisting of engineers' work area, storage areas, computer rooms, elevator, offices, and conference room enlargement.

PROJECT COST ESTIMATE: Based on a preliminary Engineering Report and in-house engineering estimates.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction</u>	---	---	---	<u>\$3,400,000</u>
Drive Motor Cooling.....	LS	---	---	829,000
Propulsion Air System.....	LS	---	---	209,000
Air Exchange Tower.....	LS	---	---	985,000
Addition to Bldg. 1146.....	LS	---	---	1,377,000
Total.....				<u>\$3,400,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1992 ESTIMATE
MODERNIZATION OF THE 16-FOOT TRANSONIC TUNNEL

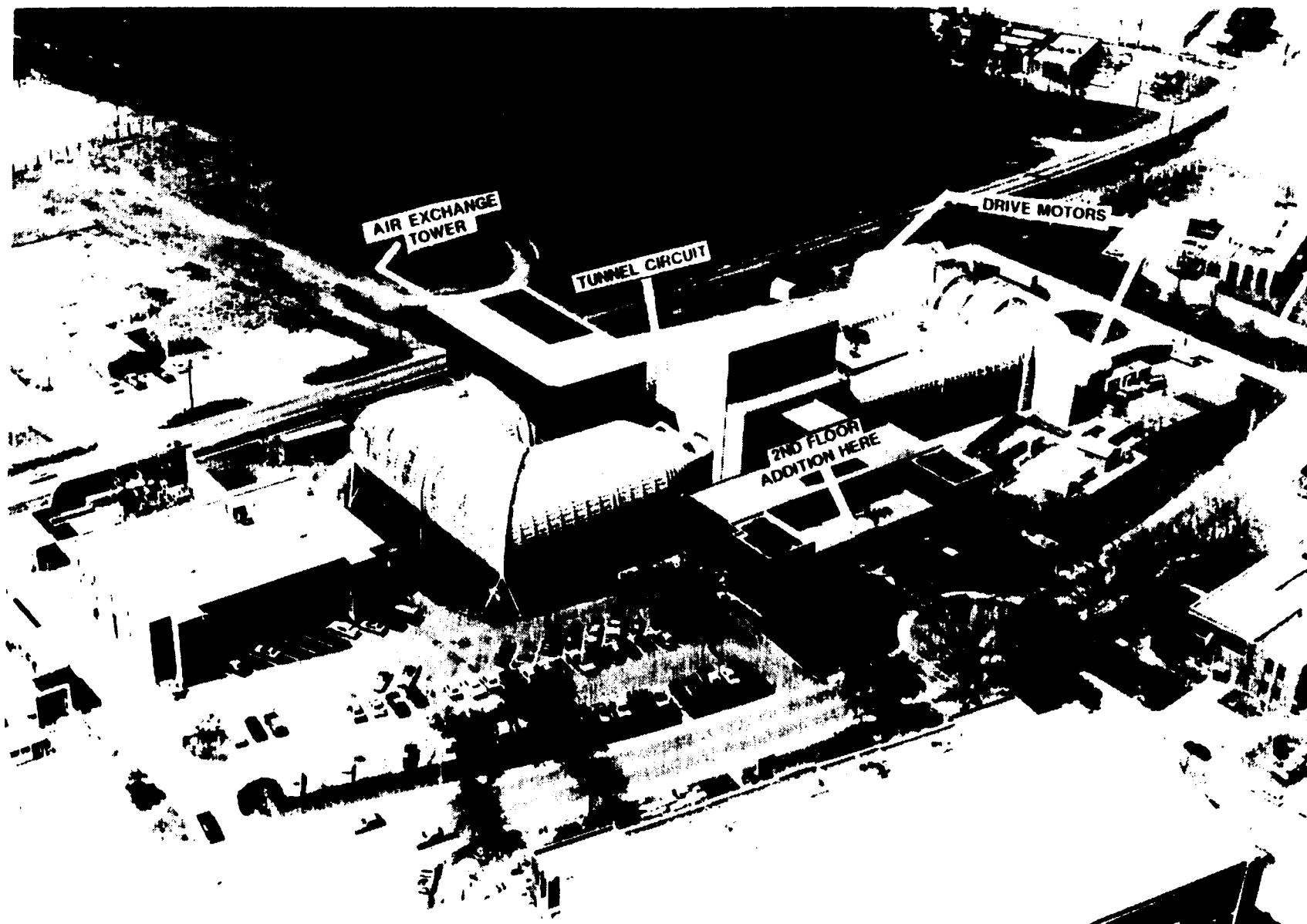


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation of Icing Research Tunnel

INSTALLATION: Lewis Research Center

FY 1992 CoF Estimate: \$2,600,000

LOCATION OF PROJECT: Cleveland, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration, and Technology (O&ET)

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$ 260,000	---	8 260,000
Capitalized Investment..... ..	---	\$ 4,063,500	4,063,500
Total	\$ 260,000	\$ 4,063,500	8 4,323,500

SUMMARY PURPOSE AND SCOPE:

This project provides for the rehabilitation of the Icing Research Tunnel (IRT) to ensure its continued operation in support of the development of all-weather aircraft and propulsion systems for the nation's aircraft. The work in the project includes the rehabilitation of various components of the facility structure and modifications which will improve test productivity and the quality of the air flow in the test sections. This project is part of the Aeronautical Facilities Revitalization Program.

PROJECT JUSTIFICATION:

The IRT is the nation's largest refrigerated icing research tunnel. It provides the testing capability to develop ice protection systems for all aircraft certified in the U.S. to fly into atmospheric conditions in which ice will

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develop on the aircraft. The IRT was designed and constructed in 1942-1944. The environmental test conditions (ice and water) within the tunnel have resulted in severe deterioration of many components. This project is needed to restore the IRT structure, pressure shell, and supports to safe and reliable operating condition and to assure the continued reliability and productivity of the unique icing capability of the IRT. Aircraft advancements have resulted in icing conditions at increased flight speeds. Modifications to the IRT are required to increase its capability for testing and development of ice protection systems at these increased flight speeds.

IMPACT OF DELAY:

A delay of the project increases the risk of a failure of the presently 45-year old structure and test section. The resulting impact for the IRT will be the delay of development of all weather capability for rotor craft and the delay of development of electronic deicing systems for the next generation transport aircraft. Programs supporting commercial aircraft testing will be impacted which will adversely affect the safety of commercial aviation in the U.S. Additionally, the development of computational capability related to predication of icing fundamentals will be impeded because the essential testing verification will be delayed.

F TION:

- A. Rehabilitation of the tunnel pressure shell by repairing the inner pressure shell, structural framing and supports along the return leg section of the tunnel. Additional work includes removal of the exterior covering and asbestos contaminated insulation, cleaning and painting of the tunnel shell, reinsulating and reskinning the tunnel.
- B. Rehabilitation of the balance chamber exterior by repairing the balance chamber exterior liner panel, pressure shell and framing; removal of asbestos contaminated insulation, and replacement with new insulation.
- C. Modification of the test section top entry hatch and the diffuser leg access hatches to improve tunnel productivity and performance.
- D. Modification of tunnel flow path profiles between the bellmouth contraction and the first downstream turn of the test section to improve flow quality.
- E. Modification of the test section viewing windows and control room to improve model viewing capability during tests.
- F. Rehabilitation of the drive motor cooling fan assembly.

PROJECT COST ESTIMATE: Based on a complete Preliminary Engineering Report

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction</u>	---	---	---	<u>\$2,200,000</u>
Rehabilitation of Tunnel Pressure Shell.....	LS	---	---	1,560,000
Rehabilitation of Balance Chamber Exterior.....	LS	---	---	480,000
Modifications to Access Hatches.....	LS	---	---	295,000
Modifications for Flow Quality Improvements.....	LS	---	---	85,000
Modifications to Test Chamber.....	LS	---	---	135,000
Rehabilitation of Drive Motor Cooling Fan.....	LS	---	---	45,000
Total.....				<u>2,600,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - IRT Tunnel Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

LEWIS RESEARCH CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF ICING RESEARCH TUNNEL

IRT TUNNEL PLAN

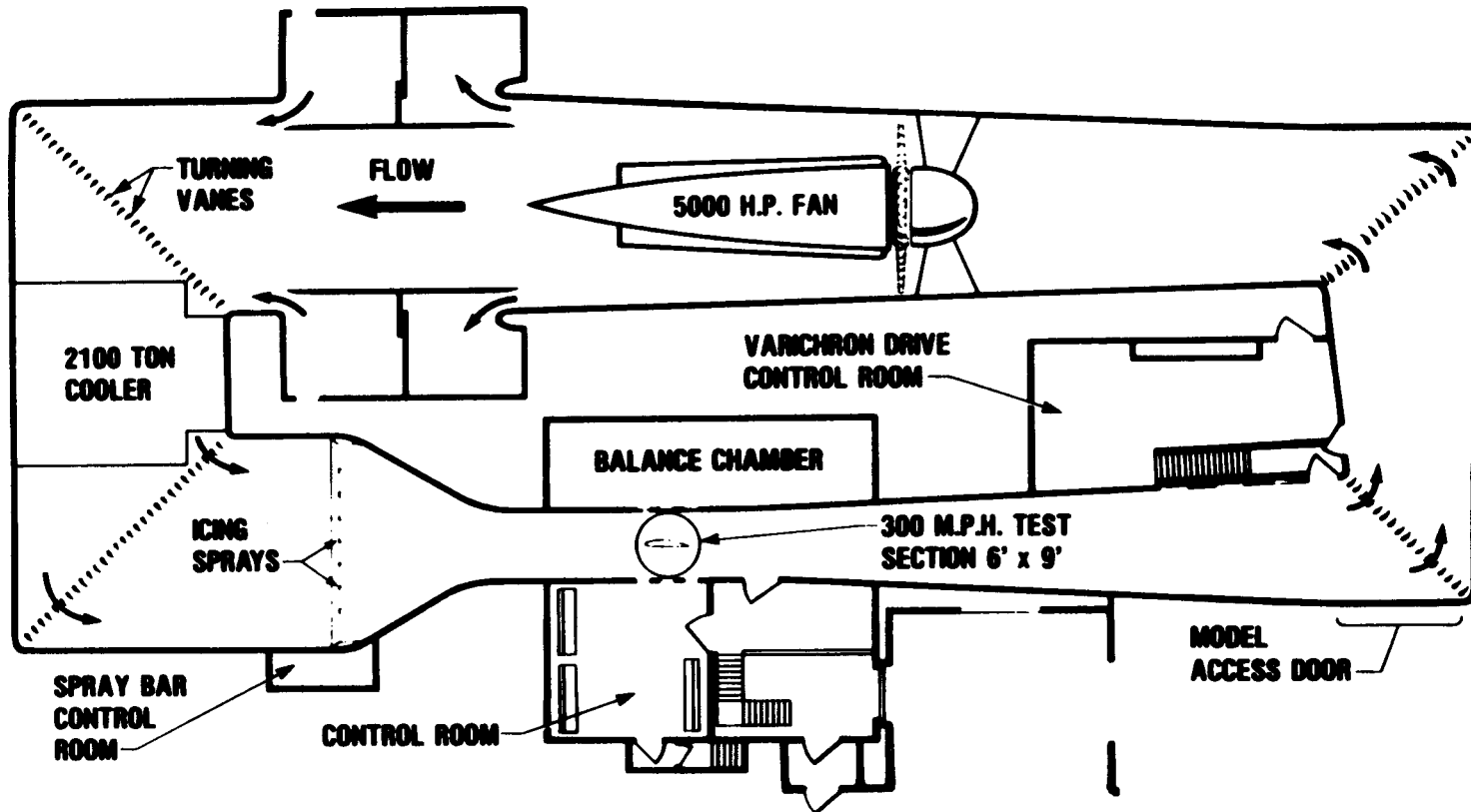


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Modifications to the High Pressure Air System

INSTALLATION: Langley Research Center

FY 1992 CoF Estimate: \$11,700,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration and Technology

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$319,618	\$12,000,000	\$12,319,618
Capitalized Investment.....	<u>---</u>	<u>3,924,101</u>	<u>3,924,101</u>
Total.....	<u>\$319,618</u>	<u>\$15,924,101</u>	<u>\$16,243,719</u>

SUMMARY PURPOSE AND SCOPE:

This High Pressure Air System is an essential element for operation of the hypersonic facilities and is used by all other major research facilities. The high pressure air usage has been steadily increasing over the past five years and has reached a critical point where new and modified facilities coming on-line cannot be accommodated. This project will provide additional high pressure air storage volume, manifolding, supports and necessary valving; a new high pressure transfer line between storage systems at Buildings 1265 and 1247E; and a new compressor pumping station located in an 810 square foot addition to Building 1247E.

PROJECT JUSTIFICATION:

The existing air storage system has been derated from 5,000 psi to 4,250 psi allowable working pressure because of system age. Also, the 3,000 psi underground storage system has been completely removed from service due to deteriorating condition. These events have reduced the LaRC usable air storage capability by more than 40 percent. The current compressor and air storage combination can only provide about 50 percent of the peak daily demand. There are currently 25 major users of the high pressure air systems. The prime users of the high pressure air systems are the hypersonic blowdown tunnels. The increased emphasis on hypersonic research data will require additional hypersonic tunnel operation. There have been several new users (National Transonic Facility, 20-inch Supersonic Wind Tunnel, and Aircraft Landing Dynamics Facility) and upgrading of other facilities (8-Foot High-Temperature Tunnel, 14- by 22-Foot Tunnel, and 16-Foot Tunnel) that have caused ~~or~~ will cause a severe impact on the existing high pressure air system's ability to keep up with demand. New storage vessels to be added by this project, in combination with existing storage systems, will be able to provide a minimum of 90 percent of the peak daily demand.

IMPACT OF DELAY:

Delay of this project will adversely affect the research programs at LaRC by causing longer experiment standby times due to lack of high pressure air availability. These tunnel facilities are under heavy demands by the NASA project offices for high performance aircraft/spacecraft development. A reliable and adequate air supply is essential to maintain current research schedules.

PROJECT DESCRIPTION:

- A. Storage Vessels - An additional 6,000-12,000 cubic feet of air storage will be added to the existing system. The storage vessels will be manifolded together to provide 500 pounds per second mass flow.
- B. Transfer Line - A new transfer line will be designed and installed between the 8-Foot High Temperature Tunnel storage system at Building 1265 and the new bottle field at Building 1247E and will be rated at 6000 psi working pressure for a maximum flow rate of 500 pounds per second at 3000 psi.
- C. Compressor Pumping Facility - The existing compressor system will be replaced with a new staged compressor system including cooling tower, valves, piping manifold, and controls to increase the capability to 792,000 pounds of air/shift at 6000 psi pressure. Since multiple compressors are required, an 810 square foot addition to Building 1247E will be erected to house the compressors and related piping, valves, and controls.

PROJECT COST ESTIMATE: Based on final design.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction.....</u>	---	---	---	<u>\$11,700,000</u>
Storage.....	LS	---	---	2,477,000
Transfer Line/Manifolds.....	LS	---	---	1,761,000
Compressor System.....	LS	---	---	5,661,000
Building Addition/Cooling Tower Supports.....	LS	---	---	1,801,000
Total.....				<u>\$11,700,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - West Area High Pressure Air Distribution System

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

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FISCAL YEAR 1992 ESTIMATE
TO THE HIGH RES

West Area High Pressure Air Distribution System

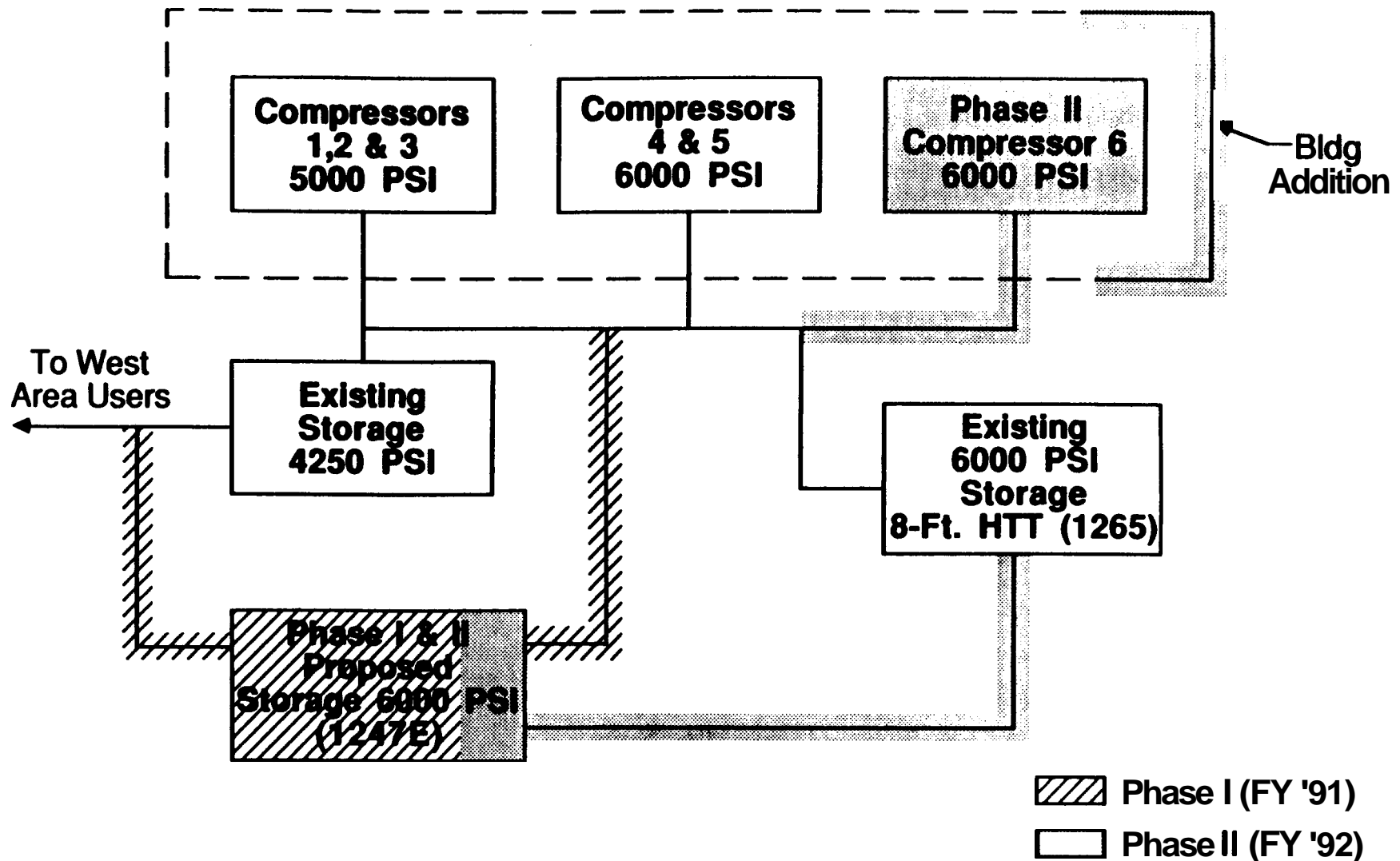


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Repair and Modernization of the 12-Foot Pressure Wind Tunnel

INSTALLATION: Ames Research Center

FY 1992 CoF Estimate: **\$25,000,000**

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration, and Technology

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$9,091,000	\$46,793,000	\$55,884,000
Capitalized Investment.....	---	<u>10,190,535</u>	<u>10,190,535</u>
Total.....	<u>\$9,091,000</u>	<u>\$56,983,535</u>	<u>\$66,074,535</u>

SUMMARY PURPOSE AND SCOPE:

This project continues the repair and modernization of the 12-Foot Pressure Wind Tunnel. The total project will return the tunnel to its original operating capability of six atmospheres, modernize tunnel control systems and model preparation areas, add new capability to make changes on test models without depressurizing the entire tunnel, and will modernize model supports within the tunnel to enable a larger range of tests. The facility is required to support the Nation's rapidly expanding requirements for low speed, low turbulence level, high quality flow and high Reynolds Number aeronautics testing. This increment of construction continues the modernization and reflects rephasing and adjustments in the total estimated cost resulting from initial high bids.

PROJECT JUSTIFICATION:

The 12-Foot Pressure Wind Tunnel is a subsonic pressure wind tunnel of national importance which has provided critical high Reynolds Number test capability to NASA, DoD, and the U.S. aircraft industry since 1946. The tunnel has an exceptionally low free stream turbulence level, high quality flow, wide range of flight regimes, and large test section capability for high fidelity models. Since 1965, essentially every military aircraft and civil

transport has been tested in the 12-Foot Pressure Wind Tunnel. The discovery of severe, unrepairable weld defects forced the derating of the tunnel to one atmosphere of pressure in September 1986 to preclude the possibility of a catastrophic failure. Without repair of the pressure shell for six atmosphere pressure operation, the 12-Foot Pressure Wind Tunnel cannot be used to provide critical high angle of attack, high lift, and laminar flow data for the development of the Nation's advanced aircraft.

The 12-Foot Pressure Wind Tunnel is a high-demand facility with tests typically scheduled eight to 16 months in advance with two-shifts-per-day operation. During its operation, the productivity was severely limited because the entire tunnel circuit had to be depressurized for model changes or adjustments. In addition, the inability to assemble, check out, and calibrate models outside the test section and the use of outdated and obsolete model support systems and controls severely hampered and limited efficient utilization of the tunnel. The modernization portion of this project will result in a significant increase in productivity with installation of a test section pressure isolation system, a modern measurement and automation system, and dedicated model preparation and calibration areas.

IMPACT OF DELAY:

The backlog of important tests continues to grow as the repair and modernization of this facility progresses. Constraints have been imposed on important aeronautical research and development which contribute to further erosion of the U.S. aeronautical competitive position relative to foreign competition and national defense. Completion of this project is essential at this time.

PROJECT DESCRIPTION:

This increment continues the replacement of the pressure shell and support structure, make-up air pressure system and compressors, and the installation of a new spherical rotating test section plenum to provide pressure isolation allowing model access without depressurizing the entire tunnel. New control systems and settling chamber internals will be initiated. The new shell will be constructed as an American Society for Mechanical Engineers (ASME) code-stamped vessel certified for six atmosphere operation. The project will include new model handling systems and supports; a solid-state speed control; modifications to the countervane, inlet guide vane and main speed controls; and a new internal radiator for airstream cooling. The existing air flow cooling system will be replaced, including piping, valves, pumps, cooling tower, and controls. Modern tunnel automation and system controls will be installed to provide feedback and control of all systems from a central location. The tunnel support building will be modified to provide a second story addition. Two model preparation rooms will be provided to allow buildup and checkout of models prior to installation in the test section thereby increasing tunnel productivity. The existing control room will be modernized to include raised computer flooring, visual access to the model staging area, control consoles, lighting, power, and HVAC as required. A new computer support room will be provided. The roof of the building will be raised to accommodate installation of a new 20-ton bridge crane.

PROJECT COST ESTIMATE: Based on a preliminary engineering report and an independent cost analysis.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction.....</u>	---			<u>\$25,000,000</u>
Shell Replacement.....	LS	---	---	13,736,000
Test Section Isolation/Model Supports.....	LS	---	---	4,667,000
Setting Chamber/Internals.....	LS	---	---	2,000,000
Controls and Automation.....	LS	---	---	2,000,000
Make-up Air Modifications.....	LS	---	---	120,000
Integrated System Test.....	LS	---	---	1,410,000
Construction Management/Inspection.....	LS	---	---	1,067,000
Total.....				<u>\$25,000,000</u>

Note: The total estimated construction cost of the project at this time is **\$102,000,000**. This **FY 1992** increment of construction was increased to offset necessary adjustments to earlier year appropriations and to reflect rephasing due to receipt of unacceptable bids in January, 1990.

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Scope

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional funding in FY 1993 estimated at **\$30,000,000** is required to complete the project.

AMES RESEARCH CENTER
 FISCAL YEAR 1992
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 T PRESSURE WIND TUNNEL

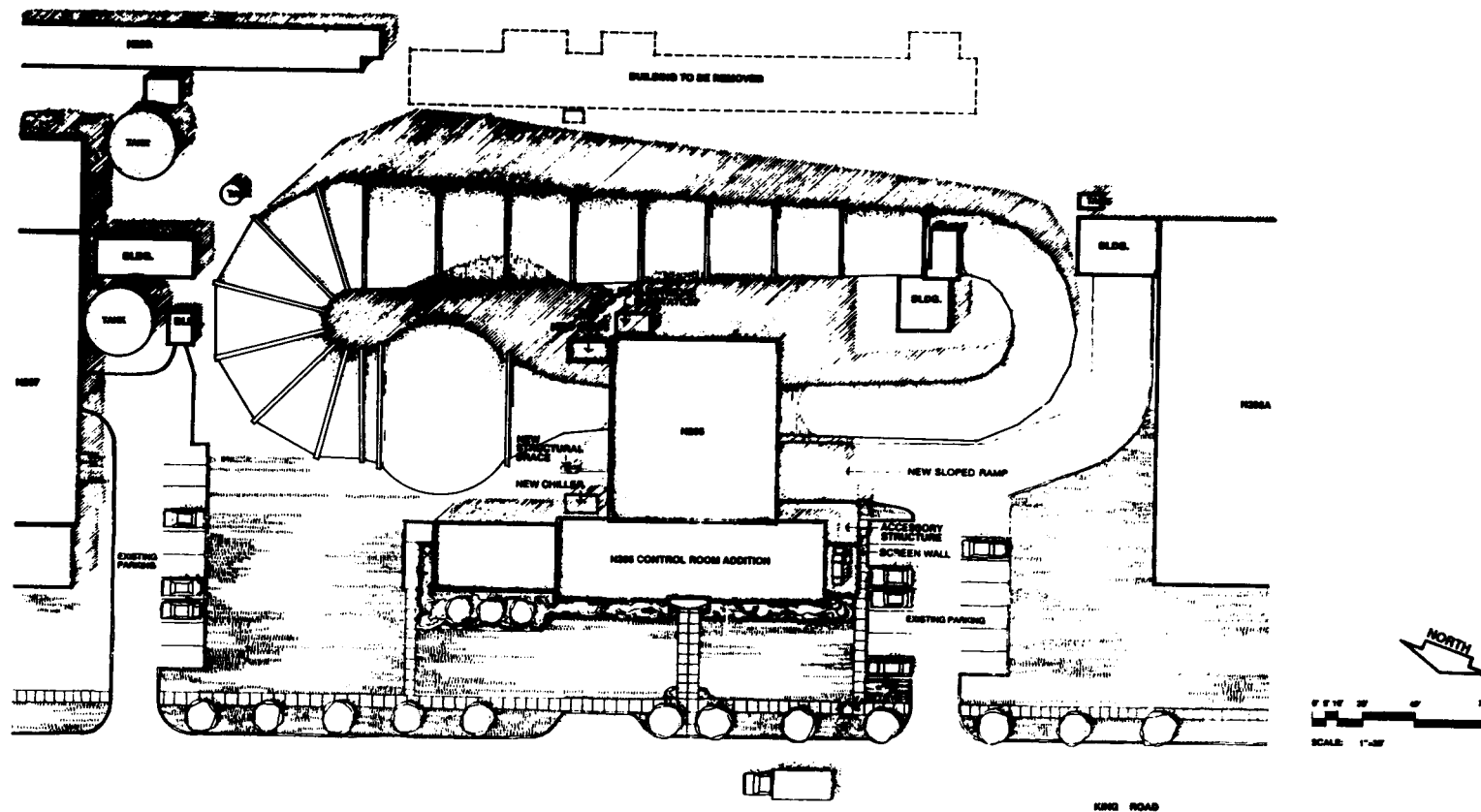
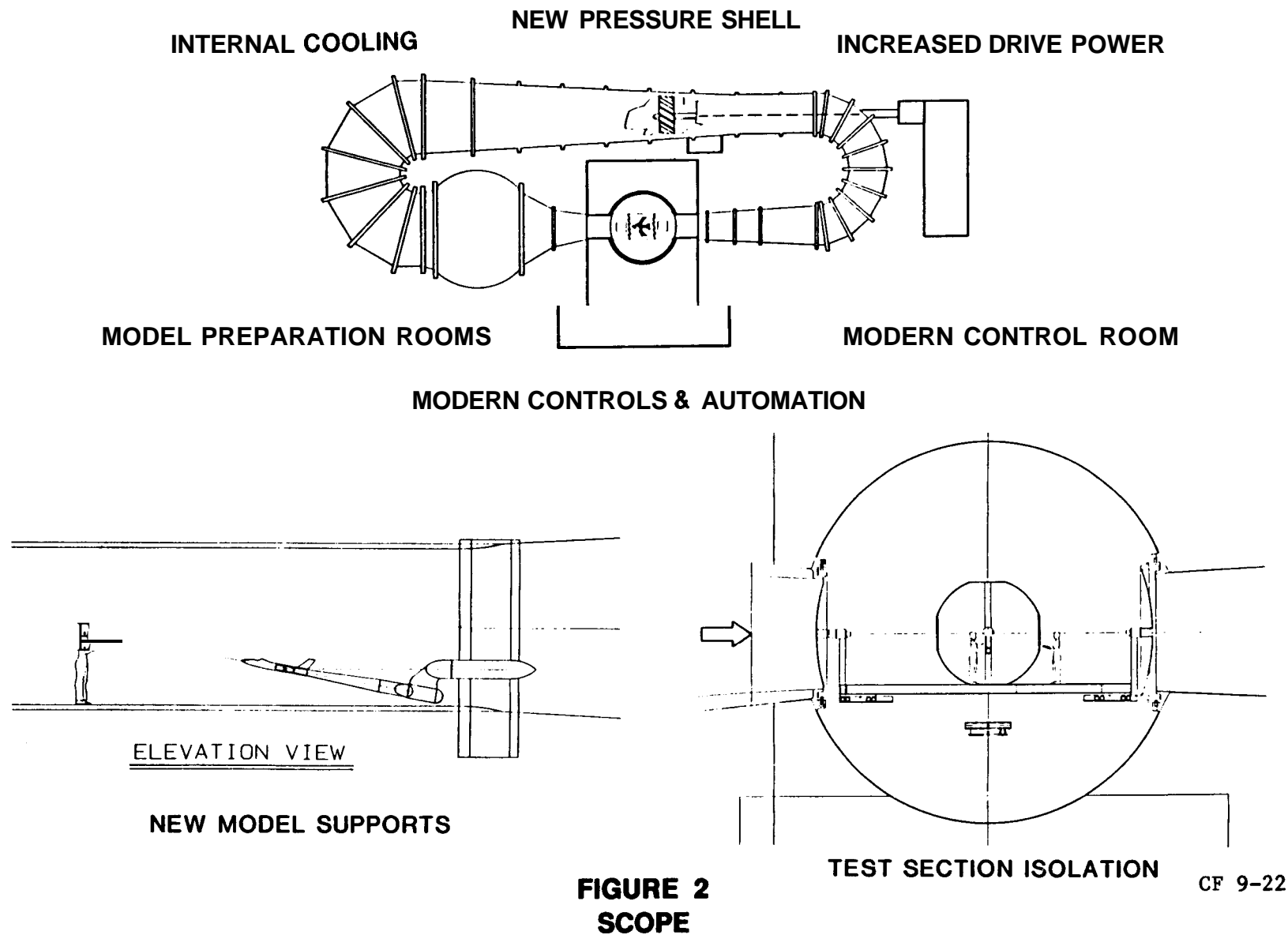


FIGURE 1
 SITE PLAN

**AMES RESEARCH CENTER
FISCAL YEAR 1992 ESTIMATES
REPAIR AND MODERNIZATION OF THE 12-FOOT PRESSURE WIND TUNNEL**



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation of Central Air System

INSTALLATION: Lewis Research Center

FY 1992 CoF Estimate: \$5,600,000

LOCATION OF PROJECT: Cleveland, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics, Exploration and Technology

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	<u>\$1,256,000</u>	<u>\$10,270,000</u>	<u>\$ 11,526,000</u>
Capitalized Investment.....	<u>---</u>	<u>\$38,300,000</u>	<u>38,300,000</u>
Total.....	<u>\$1,256,000</u>	<u>\$48,570,000</u>	<u>\$49,826,000</u>

SUMMARY PURPOSE AND SCOPE:

This project is part of the NASA Aeronautical Facilities Revitalization Program and provides for rehabilitation and modernization of the principal 450 psig compressed air machinery, conditioning equipment and central control of the LeRC Central Air System (CAS). The system provides 450 psig low humidity air and dry combustion air to various test cells for research purposes. The facilities in this project are critical for providing safe centralized operational support of process systems for research programs associated with the development of advanced aeropropulsion systems.

PROJECT JUSTIFICATION:

The Central Air System (CAS) is a collection of air handling equipment that provides compressed air and altitude exhaust air for a wide variety of experimental research and development programs. The CAS provides compressed air at various pressures, temperatures, humidity levels and flow rates, as well as exhaust capability at various vacuum levels and flow rates for simulating altitude flight conditions. The air is

supplied from a diversity of compressors, exhausts, large drive motors, chillers, heaters, dehydrators, cooling towers and other auxiliary equipment located primarily in or near the Central Air Equipment Building (CAEB) and the Engine Research Building (ERB). The availability of reliable low humidity combustion air is critical to LeRC research programs.

This project provides for rehabilitation of this system, so that it can continue to support aeronautical research facilities such as supersonic, transonic, subsonic, and icing wind tunnels; full-scale turbo-jet engine test cells; and engine component test cells. Specifically, the rotors of the C-4 compressor located at ERB (Bldg. 5) have been in service for approximately 40 years and to ensure continued safe and reliable operation, the rotors must be replaced together with associated seals, bearings and guide vanes. To ensure electrical integrity, the electric drive motor must be rewound. The Air Dryer Regeneration System has experienced frequent failures due to thermal cycling, plugged heater and cooler tubes and leaking gas joints. If not repaired, total failure could occur. This system is the primary source of low humidity combustion air which is vital for research operations. The CAS master control station located in the Central Control Building (143) and providing centralized equipment operator stations, air distribution scheduling, electrical power distribution, data collection, and operational reporting must be modernized. Some equipment is obsolete and spare parts are no longer available. Since initial installation, growing research programmatic needs have fully utilized all existing CAS expansion capability. This project is required to keep system performance levels acceptable and provide for future expansion.

IMPACT OF DELAY:

The delay of this project will significantly increase the risk of unscheduled and lengthy shutdowns of one or more major aeronautical research facilities.

PROJECT DESCRIPTION:

- A. Rehabilitation of C-4 Compressor: Replace deteriorated rotors, bearings and seals and rewind electric drive motor;
- B. Rehabilitation of Dryer Regeneration System: Replace and repair Propulsion Systems Laboratory (PSL) Desiccant Air Dryer Regeneration System. The natural gas heater, air cooler, main blower, main motor and dewpoint measurement system will be replaced. All associated piping, valves and controls will be replaced or repaired as required;
- C. Rehabilitation of Central Control System:
 - 1. Rehabilitation of the Master Station host processors through replacement of three supervisory processors, all associated devices (such as disk drives, tape recorders, array processors, and programmer's terminal.
 - 2. Rehabilitation of the Supervisory Control and Data Acquisition (SCADA) software through replacement of the SCADA operating system and special applications software.

3. Rehabilitation of the SCADA Remote Terminal Units (RTU) through replacement of 35 RTU's.
4. Rehabilitation of the SCADA Programmable Logic Controllers (PLC) through modernization of the 14 PLC's with new Central Processing Units (CPU's) and expanded memory.
5. Addition of a new PLC system for improved control **and** monitoring of Cooling Towers.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$5,600,000</u>
Rehabilitation of Compressor C-4.....	LS	---	---	85,000
Rehabilitation of Dryer Regeneration System.....	LS	---	---	340,000
Rehabilitation and Upgrade of Central Control Sys.	LS	---	---	4,405,000
Total.....			<u>\$5,600,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Project Location

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional funding in FY 1993 estimated at \$12,200,000 is required to complete the project.

**LEWIS RESEARCH CENTER
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF CENTRAL AIR SYSTEM**

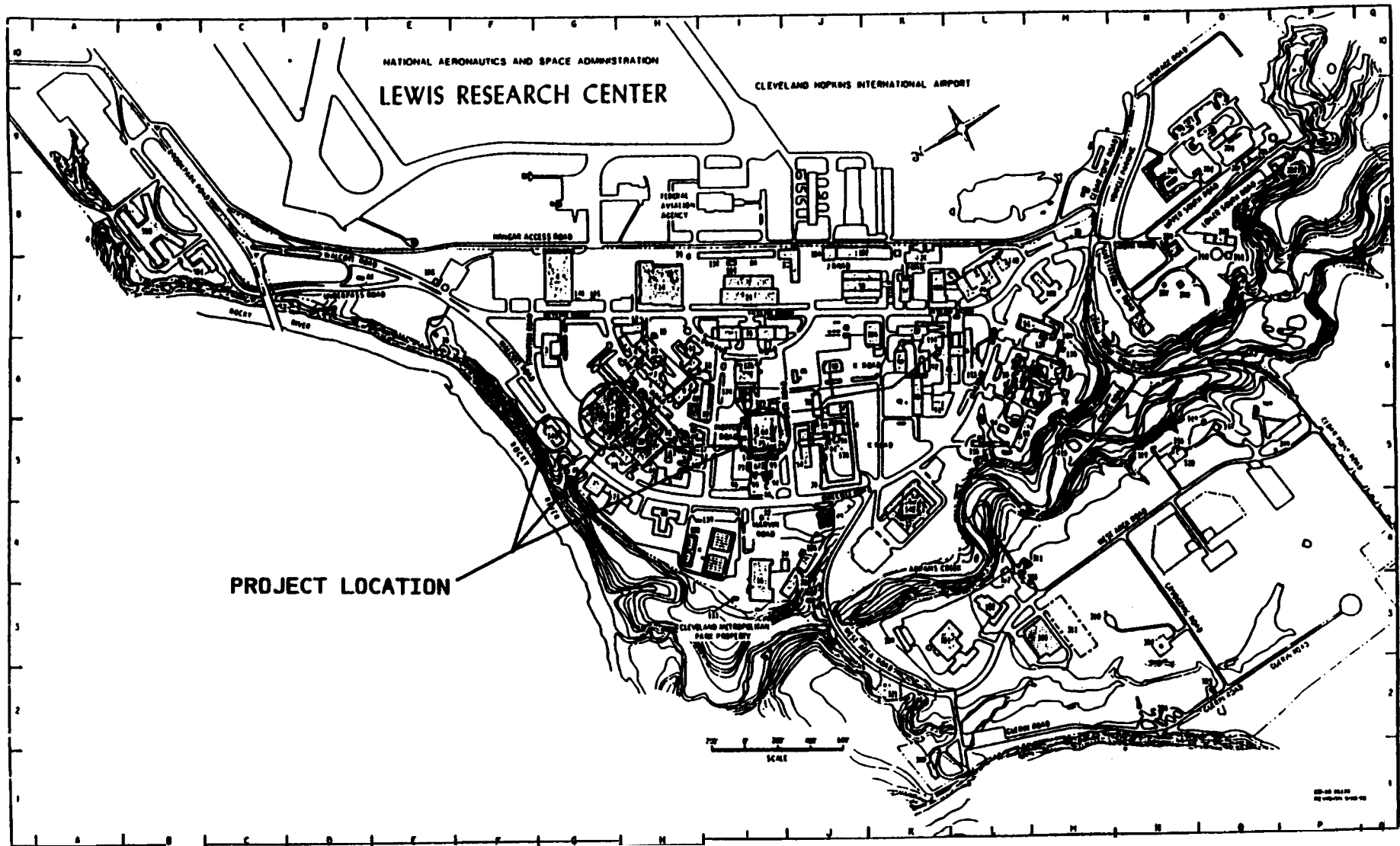


FIGURE 1

VARIOUS LOCATIONS .I

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

VARIOUS LOCATIONS

	Amount ----- (Dollars)	Page No. -----
Office of Space Operations:		
Construction of Data Interface Facility, White Sands Test Facility, NM.....	4,000,000	CF 10-1
Rehabilitation of Tracking and Data Relay Satellite System (TDRSS) Ground Terminal, White Sands Test Facility, NM.	5,700,000 -----	CF 10-5
Total.. ..	9,700,000 =====	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Construction of Data Interface Facility

INSTALLATION: White Sands Test Facility

FY 1992 CoF Estimate: \$4,000,000

LOCATION OF PROJECT: Las Cruces, Dona Ana County, New Mexico

COGNIZANT HEADQUARTERS OFFICE: Office of Space Operations

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$370,000	---	\$370,000
Capitalized Investment.....	---	---	---
Total.	<u>\$370,000</u>	<u>---</u>	<u>\$370,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a 27,000 gross square foot building designated as the Data Interface Facility (DIF) which will be the key communication interface between the Tracking and Data Relay Satellite System (TDRSS) and ground based mission and data operations facilities for all future NASA missions.

PROJECT JUSTIFICATION:

This facility supports a new programmatic requirement for automatic communications processing, direct distribution of mission data and simultaneous capture at the TDRSS ground site. Its purpose is to reduce the time for data delivery, assure data quality, handle significantly higher data rates, provide long-term data archival storage, and reduce communication and operational costs. The DIF is a generic system to be used by all NASA missions. A number of new major high data rate initiatives, including the Space Station Freedom and the Earth Observing System (EOS) programs, have substantially influenced the DIF capabilities. As a critical element within these programs, the DIF is needed early to support integration testing and operations simulations in the early 1990's.

IMPACT OF DELAY:

Delay of this project will directly impact the implementation schedule for the Customer Data and Operations Systems (CDOS) Project. The DIF is an integral part of the advanced communications and data processing architecture being implemented. The DIF will support engineering level testing and mission simulations for the Space Station Freedom's First Element Launch.

PROJECT DESCRIPTION:

The DIF will be a 27,000 gross square foot single floor facility. It will be located within the existing TDRSS security perimeter. No environmental or archaeological impacts are expected. Heating, ventilation, and air conditioning systems; emergency power generators; and an uninterruptible power supply are required. Approximately 10,650 square feet will be raised floor. Since the DIF does not transmit or process classified data, only normal automated information system levels of security are necessary.

PROJECT COST ESTIMATE: Based upon Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
<u>Construction:</u>	---	---	---	<u>\$4,000,000</u>
Site Development.....	LS	---	---	240,000
Architectural/Structural.....	SF	27,000	41.63	1,124,000
Mechanical.....	SF	27,000	40.96	1,106,000
Electrical.....	SF	27,000	56.67	1,530,000
Total				<u><u>\$4,000,000</u></u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Prespective Drawing

OTHER EQUIPMENT SUMMARY

The facility will require communications, an archival equipment of approximately \$300 million to be funded from Space Flight, Control and Data Communications (SFCDC) resources in FY 1992-FY 1997.

URE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: N

WHITE SANDS TEST FACILITY
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF DATA INTERFACE FACILITY

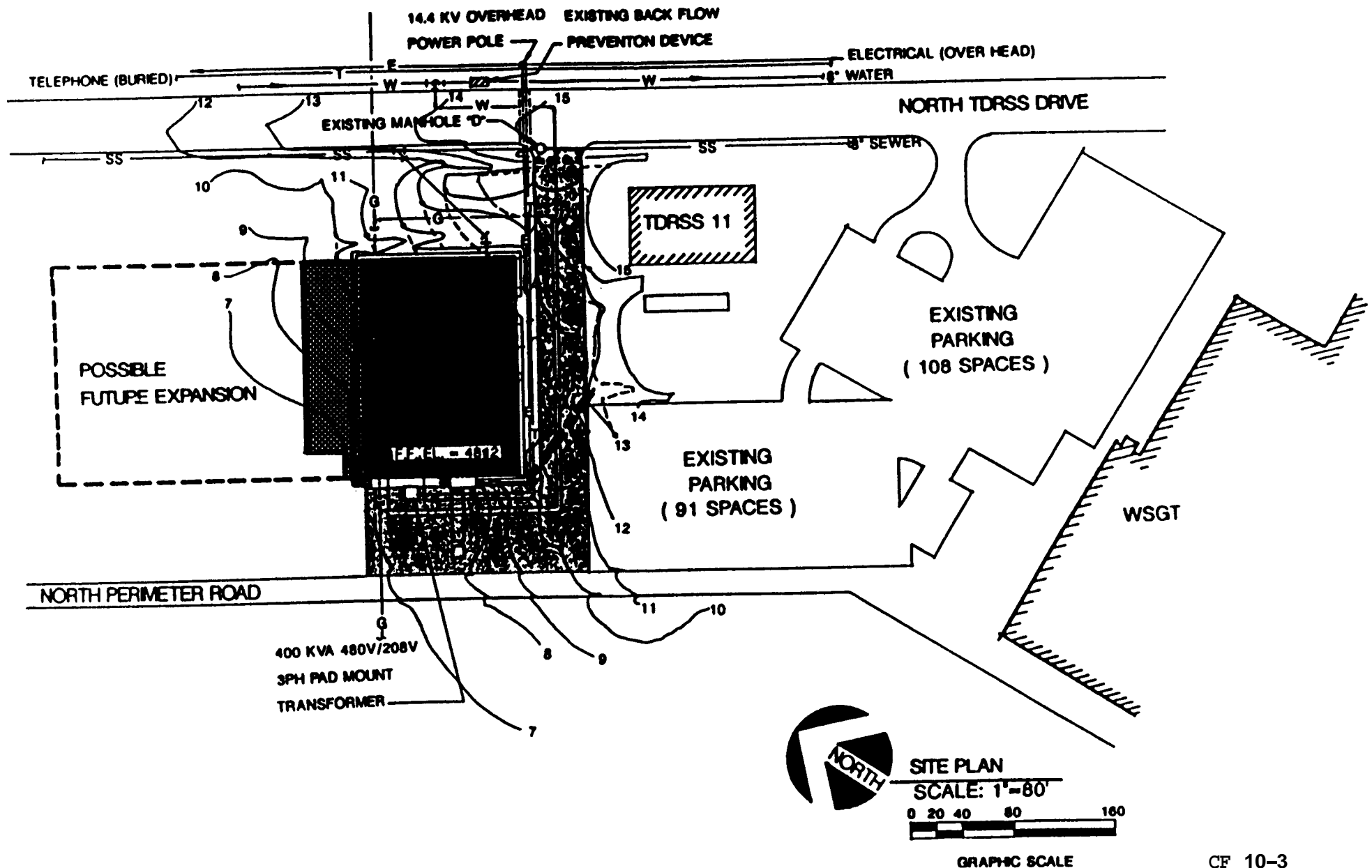


FIGURE 1
SITE PLAN

WHITE SANDS TEST FACILITY
FISCAL YEAR 1992 ESTIMATES
CONSTRUCTION OF DATA INTERFACE FACILITY

PERSPECTIVE

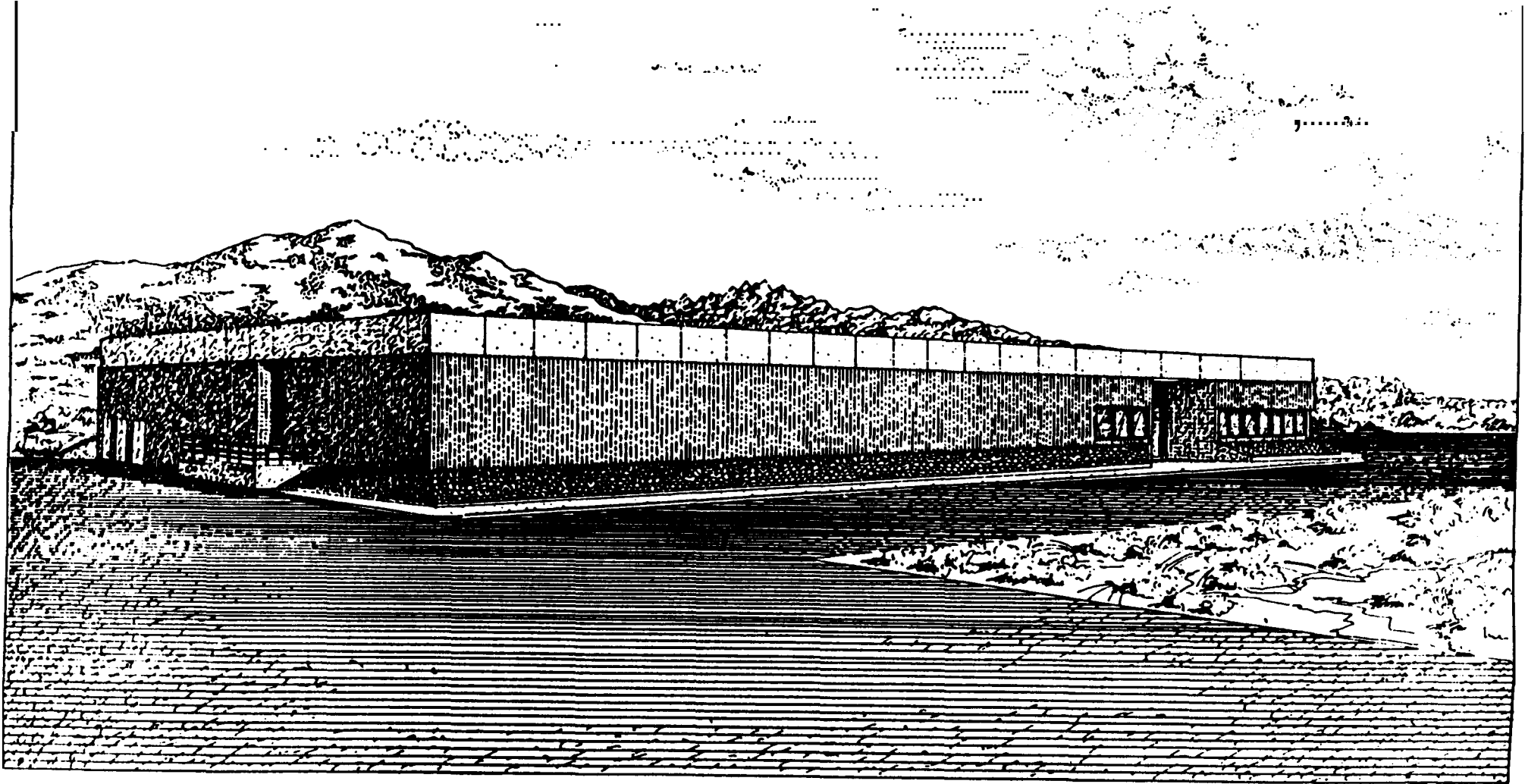


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation of Tracking and Data Relay Satellite System (TDRSS) Ground Terminal

INSTALLATION: White Sands Test Facility

FY 1992 CoF Estimate: \$5,700,000

LOCATION OF PROJECT: Las Cruces, Dona Ana County, New Mexico

COGNIZANT HEADQUARTERS OFFICE: Office of Space Operations

FY 1991 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$450,000	---	\$ 450,000
Capitalized Investment.....	---	<u>\$17,921,000</u>	<u>\$17,921,000</u>
Total.....	<u>\$450,000</u>	<u>\$17,921,000</u>	<u>\$18,371,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for major rehabilitation and modification of the 65,000square foot facility that houses the original Tracking and Data Relay Satellite System (TDRSS) ground terminal systems, equipment and operations. This work is required to accommodate major replacement and upgrade of the 15-year-old TDRSS ground terminal equipment to assure sustained, reliable, and efficient operations into the year 2000 and beyond.

PROJECT JUSTIFICATION:

The original TDRSS ground terminal currently is the primary operational ground facility of the communications and data Space Network supporting numerous near-earth space vehicles and payloads. The existing ground terminal systems, which will be more than 15 years old at the time of this project, have high susceptibility to single-point failures due to age and obsolescence, extensive and costly hardware and software maintenance requirements, limited status and performance monitoring capability, and inflexibility to accommodate changes. The Second TDRSS Ground Terminal (STGT) at White Sands Test Facility, which will become operational in early 1993, will incorporate significantly changed, improved equipment and software to overcome current deficiencies. Until the original ground terminal is upgraded to the current technology of the STGT, the combined TDRSS ground terminal performance reliability will remain marginal. Significant inefficiencies will exist because of the marked differences between the STGT and the original ground terminal. The systems upgrade at the original ground terminal cannot be accomplished without the major facility modifications provided by this project.

IMPACT OF DELAY:

If this project is delayed, the required upgrade of the original TDRSS ground terminal will be delayed, reducing the reliability of the ground segment of the Space Network. The planned construction schedule is critically linked to STGT operational readiness and minimum downtime for the original ground terminal. Delay of this project will increase the Space Network vulnerability.

PROJECT TION

Structural, architectural, electrical, and mechanical modifications of the 65,000 square foot facility will be made to accommodate current-technology equipment and operations and to provide enhanced utilities reliability and facility safety. Numerous interior walls, a mezzanine, and a hallway will be removed: some doorways will be enlarged; additional floor and ceiling areas will be raised; and resultant structural adjustments will be provided. A flight support room, a new larger vault, and a tape storage room will be installed. Outdoor antenna mount and concrete waveguide tunnel modifications will be required to support changes to the site antennas. Electrical power capacity and distribution will be changed significantly; the uninterruptible power supply will be changed to all 60 Hz and will be augmented; and the emergency diesel-generator backup power system, with enclosure will be augmented. The existing Halon fire protection system will be disabled and purged to comply with limitations on ozone-depleting CFC's and halons, and a water sprinkler system will be installed where required. The heating, ventilating, and air-conditioning system will be modified as required by the additional loads and building changes. Facility provisions for secure access control will be retained, modified, or installed as necessary to meet designated perimeter control zone requirements.

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PROJECT COST ESTIMATE: Based on Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$5,700,000</u>
Architectural/Structural	LS	---	---	838,000
Mechanical.....	LS	---	---	1,527,000
Electrical.....	LS	---	---	2,860,000
New Sprinkler System.....	LS	---	---	475,000
Total.....				<u><u>\$5,700,000</u></u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY:

New communications and data systems equipment and software are being provided from Space Flight, Control and Data Communications resources in the amount of approximately \$70 million during FY 1990 - FY 1993.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.

WHITE SANDS TEST FACILITY
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS)
GROUND TERMINAL

SITE PLAN

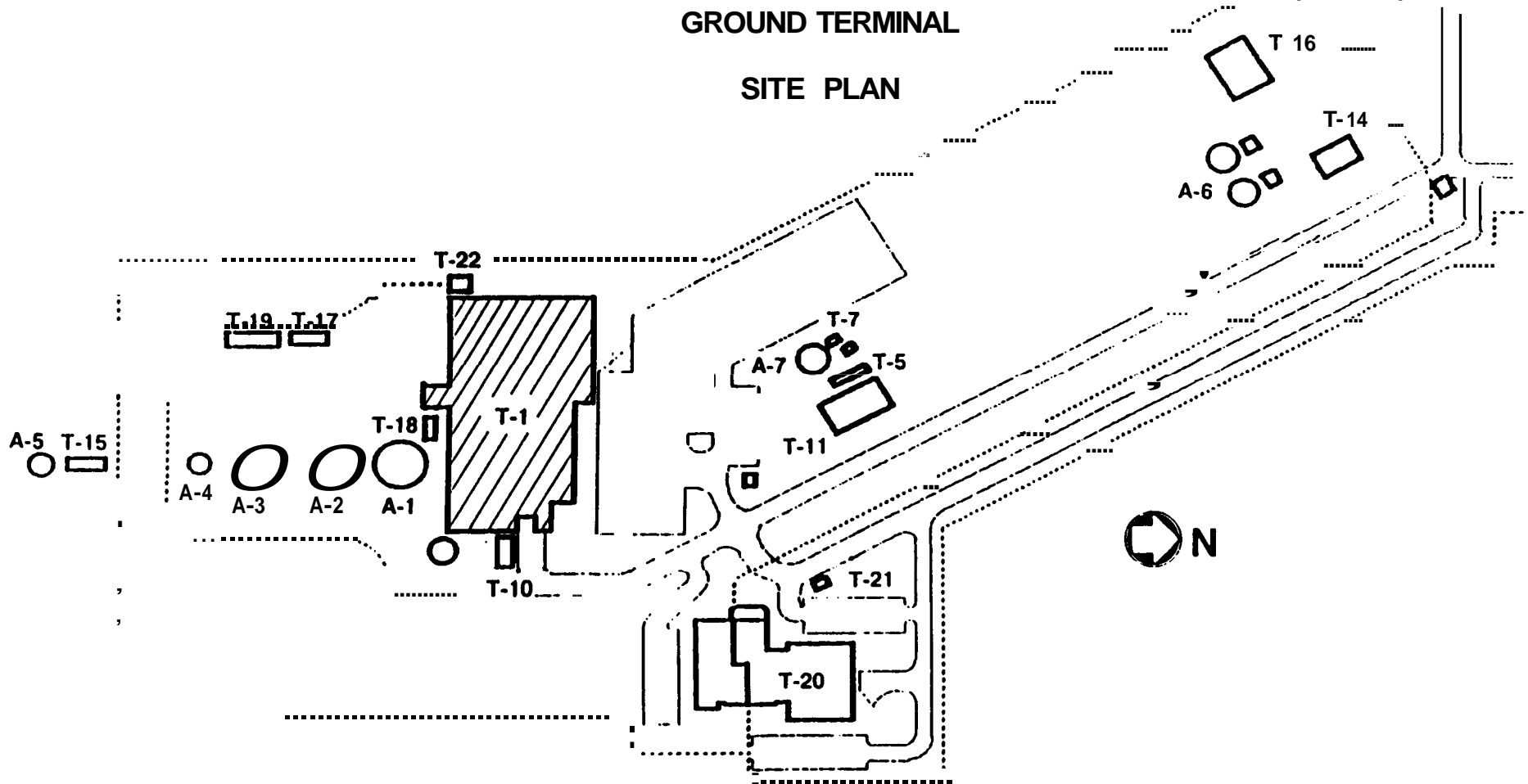


FIGURE 1

**WHITE SANDS TEST FACILITY
FISCAL YEAR 1992 ESTIMATES
REHABILITATION OF TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS)
GROUND TERMINAL**

PERSPECTIVE

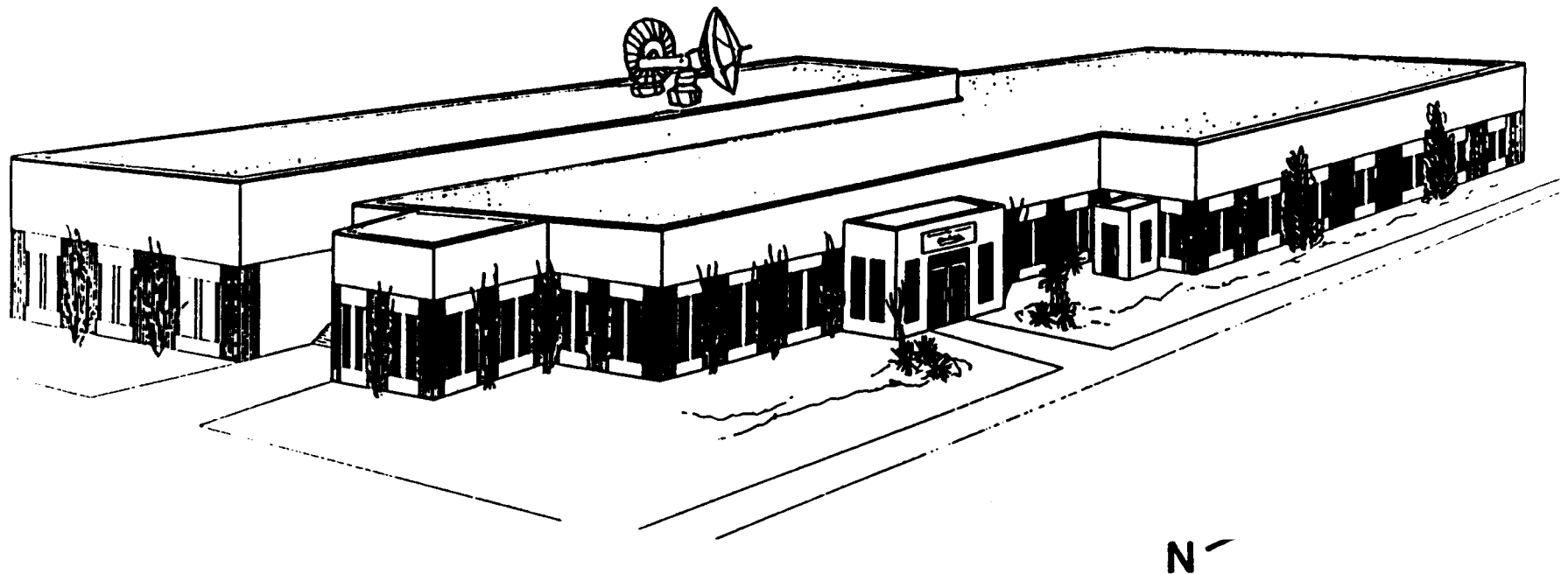


FIGURE 2

REPAIR

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

SUMMARY

REPAIR

Summary of Project Amounts by Location:

	<u>Amount</u>	<u>Page No.</u>
Ames Research Center.....	\$3,380,000	CF 11-3
Dryden Flight Research Facility.....	500,000	CF 11-4
Goddard Space Flight Center.....	2,170,000	CF 11-4
Jet Propulsion Laboratory.....	2,500,000	CF 11-5
Johnson Space Center.....	2,480,000	CF 11-6
Kennedy Space Center.....	3,270,000	CF 11-7
Langley Research Center.....	3,510,000	CF 11-8
Lewis Research Center.....	3,650,000	CF 11-10
Marshall Space Flight Center.....	1,880,000	CF 11-11
Michoud Assembly Facility.....	2,710,000	CF 11-12
Stennis Space Center.....	1,425,000	CF 11-13
Wallops Flight Facility.....	2,500,000	CF 11-13
Various Locations.....	560,000	CF 11-14
Miscellaneous Projects Not in Excess of \$250,000 Each.....	<u>1,165,000</u>	CF 11-14
Total.....	<u>\$31,700,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Repair of Facilities, Not in Excess Of \$1,000,000 Per Project

INSTALLATION: Various Locations

FY 1992 CoF ESTIMATE: \$31,700,000

FY 1990: \$27,200,000

FY 1991: \$30,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for large repairs to facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in the request are those facility repair needs for FY 1992 that can be predicted at the time of the submission of these estimates and are not to exceed \$1,000,000 per project. The thrust of this program is to restore facilities and components thereof, including collateral equipment, to a condition substantially equivalent to their originally intended and designed capability. The request includes the substantially equivalent replacement of utility systems and collateral equipment necessitated by incipient or actual breakdown. This work also includes major preventive measures which are normally accomplished on a cyclic schedule of greater than one year.

PROJECT JUSTIFICATION:

NASA is now experiencing "block obsolescence" where a substantial portion of the agency's facilities has reached the 25-year age point. Repair costs for mechanical and electrical systems in a typical building are almost three times higher after system operation exceeds 15-20 years than they are during the initial years. Many electrical and mechanical components reach the end of their serviceable or economic life at the 20 year point and should be replaced in the interest of long-term economy. Continued piecemeal repair of these components is usually more costly in the long run than replacement at the end of the economic life of the original components. Approximately 50 percent of NASA's physical plant has reached 25 years in service.

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A major thrust of this repair program is to help preserve the capabilities of the NASA \$4.3 billion physical plant which has a current replacement value of more than \$13 billion. This work must be addressed and progressively accomplished. Otherwise, risks are increased and future repair costs will be significantly greater. More importantly, there will be increased breakdowns, interruption of critical operations and costly unscheduled repairs incurred.

This program includes only facility repair work having an estimated cost not in excess of \$1,000,000 per project. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance and repair activities. Repair projects estimated to cost more than \$1,000,000, are included as separate discrete projects in the budget request.

PROJECT DESCRIPTION:

Proposed repair projects for FY 1992 totaling \$31,700,000 are described under "PROJECT COST ESTIMATE." Projects estimated to cost not in excess of \$250,000 have not been individually described or identified by Center. The total request for this category is \$1,165,000. This repair program has been distilled from requests of approximately \$52,000,000, and thus represents a modest request in relation to the continuing backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are of the highest priority. Deferral of this mission-essential work would adversely affect the availability of critical facilities and program schedules.

During the course of the year, it is recognized that some rearrangement of priority may be necessary. This may force a change in some of the items to be accomplished. Any such change, however, will be accomplished within total available repair resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE" :

a. Utility Systems.....	12,030,000
b. General Purpose Buildings.	5,240,000
c. Technical Buildings/Structures.	4,770,000
d. Pavements and Drainage.....	4,720,000
e. Building Exteriors and Roofs.....	4,940,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC)..... \$3,380,000

1. Repair of Pressure Systems..... 900,000

This project provides for weld repair and parts replacement on the 140 pound per square inch compressed air tie line between the Unitary Plan Wind Tunnel Auxiliaries Building (N-227D), and the 12-Foot Pressure Wind Tunnel Compressor Building (N-206A). Recertification inspections have revealed faulty welds and construction that do not meet current pressure system standards, and could jeopardize safety of personnel and equipment. Repair is required to minimize the risk of catastrophic failure and to assure compressed air is supplied to research facilities.

2. Repair of Heating Systems, N-236..... 400,000

This project provides for replacement of the steam boiler, steam lines and manifold, and associated piping, controls, and pumps for the Bioscience Laboratory Building. The boiler and air handler operate continuously. They were installed in 1964, and have reached the end of their useful life. Extraordinary efforts are required to keep the system operational. Replacement parts are no longer available. Unreliable operation and excessively high maintenance costs will continue until this project is completed.

3. Repair of Heating, Ventilating, and Air-conditioning System, N-241..... 340,000

This project provides for replacement of the hot water heating system in the Administrative Management Building, including the boiler, pipes, insulation, coils, pumps, and controls. The existing system is 28 years old and corroded. The boiler has had its life extended by retubing, but now must be replaced. Air conditioning units are leaking. Replacement parts are not available. Cost to maintain the system is excessive. Continued use will increase operational costs and decrease reliability.

4. Repair Roofs, Various Buildings..... 790,000

This project provides for roof repairs on Buildings N-210, N-240, and N-240A (Flight Systems Research Laboratory, Airborne Missions and Applications, and Life Sciences Flight Experiments, respectively). Repairs will include total replacement of roof surfaces and repair or replacement of underlayment, beams, insulation, flashing, and drains. These roofs have been leaking and maintenance efforts have not been effective in permanently stopping the leaks. The roofs are at the end of their useful life and require replacement to prevent damage to the building and equipment inside.

5. Replace Cooling Tower, N-229A	950,000
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This project provides for replacement of the three-cell cooling tower structure, fill, fan stacks, fans, piping, equipment, and motor controls supporting the 3.5-ft. Hypersonic Wind Tunnel and the Arc Jet Tunnels complex. This 30-year-old cooling tower has not been refurbished since its installation. Repairs are becoming more costly and downtime is increasing. Pipes which have corroded must be patched to keep the system operational. If not repaired soon, the tower may collapse, adversely affecting research in aerobraking, high enthalpy, and National Aerospace Plane aerodynamic testing.

B. <u>Dryden Flight Research Facility (DFRF)</u>	<u>~500,000</u>
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1. Repair Chillers and Cooling Towers, Buildings 4800 and 4982.....	500,000
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This project provides for replacement of existing cooling towers, chillers, and package air-conditioning units in the Research, Development, and Test Building (4800) and in the FPS-16 Radar Building (4982). Replacements include two 300-ton chillers and cooling towers in Building 4800 and two 20-ton chillers and one 50-ton cooling tower in Building 4982, including controls and piping. The equipment has reached the end of its serviceable life and spot repairs are no longer effective. The equipment supports critical computer equipment and Western Aeronautical Test Range operations areas.

C. <u>Goddard Space Flight Center (GSFC)</u>	<u>82,170,000</u>
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1. Repair Space Environment Simulator (SES) Cryogenic Sources, Building 10.....	800,000
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This project provides for the complete overhaul of the major components of the Space Environmental Simulator (SES) helium cryogenic source including: refurbishment/replacement of high and low stage compressors, heat exchangers, drive motors and ancillary equipment. The SES helium cryogenic source is a helium refrigeration skid that is approximately 25-30 years old. The unit is failing due to life-cycle fatigue, and requires refurbishment. Extensive temporary repairs are required to put the system on line and result in high labor cost and costly delay in the testing schedule. Complete overhaul would preclude these high costs during future testing of cryogenic payloads.

2. Repair Air Handling Units in Buildings 1, 5 and 6.....	900,000
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This project completes the repair of air-handling systems in the Space Projects Building (Building 1), the Instrument Construction and Development Laboratory (Building 5), and the Space Sciences Laboratory (Building 6). Work includes: general repairs, calibration of controls and dampers, fan motor replacement, piping replacement/repairs, asbestos removal and reinsulation, system balancing, installation of fire detection/protection equipment, coil replacement, and installation of humidification equipment. Specific repairs vary depending on condition of individual units. Severely deteriorated systems are to be replaced in

their entirety. The air-conditioning systems in these buildings have exceeded their design life and are inadequate for their present usage.

3. Repair Roofs, Buildings 18 and 20.. 470,000

This project provides for the removal and replacement of existing roofing on Buildings 18 and 20, including removal and replacement of associated coping, flashing, roof insulation, and other roof related accessories as necessary. Approximately 40,400 square feet of roofing will be replaced. Drainage problems will be corrected and rooftop walkways will be provided. The existing roofing on these buildings contains numerous patches and temporary repairs. The proposed rehabilitation will restore the integrity of these roofing systems and will minimize potential property loss from water damage due to leaks. Replacement of water soaked insulation will also increase energy efficiency in these facilities.

D. Jet Propulsion Laboratory (JPL)..... \$2,500,000

1. Replace Ceiling and Lighting (169) goo,000

This project replaces the ceiling system and light fixtures of the laboratories, offices and corridors of two floors of Building 169. The total project area is approximately 16,000 square feet. The existing suspended acoustic tile ceiling will be removed and replaced with acoustic lay-in panels in a tee bar suspension system. Surface mounted, recessed or pendant mounted light fixtures will be replaced with recessed or surface mounted 3-lamp fluorescent light fixtures. The HVAC system will also be modified. Building 169 was built in the mid-1960's and the existing materials, equipment or systems have exceeded their useful life and in many instances, do not comply with current codes and standards.

2. Replacement of Air Handling Systems,
Physical Sciences Laboratory (183)..... goo ,000

This project replaces deteriorating air handlers on three floors with modern air handlers properly zoned for the current requirements of the building. Unneeded air conditioning ducting and piping and excess fume exhaust ducting will be removed. Control devices will be modernized for better and more economical control of the building air conditioning systems. Asbestos fireproofing will be abated in the areas as necessitated by the removal and installation of air conditioning and other utility systems. The existing air handlers are rusted and leaking. Extensive repairs of the existing system are badly needed.

3. Replacement of Utility Tunnel, Edward Test Station (ETS)..... 700,000

The project provides for the replacement of approximately 300 linear feet of existing corrugated metal pipe (CMP) utility tunnel from Test Stand C to Test Stand B and from Test Stand B to the 'T' junction enroute to Test Stand A. Included in the project is the construction of a new 'T' junction north of Test Stand A and at Test Stand 'B'. There is also included a building connection at Test Stand 'B' and one at Test Stand

'C'. The new tunnel will be approximately 6' wide by 7'-6" high in interior dimension and will be of concrete masonry wall construction with concrete floor and roof slabs. Cable trays and utilities will be installed on the walls of the tunnel. Communication, power and other utility services both inside and above the existing tunnel will be maintained with minimum interruption during construction. This section of the CMP tunnel is corroded and deformations are noted at several spots. The proposed repair will restore the tunnel to its original functionality and prolong its useful life.

E. <u>Johnson Space Center (JSC)</u>	<u>\$2,480,000</u>
1. Repair Fire Alarm Systems	680,000

This project provides for the replacement of existing fire alarm annunciator panels with state-of-the-art fire alarm panels. This project includes buildings 32, 33, 34, 36, 41, 49, 207A, 220, 226, 228, 230, 260, 260A, 261, 262, 263, 321, 323, 325, 326, 328, 329, 333, 336, 338, 350, 351, 352, 353, 354, 356, 359, 380, 417, 419, 420, and 471 on the main site and buildings 135, 136, 140, 245, 265, 276, and 278 at Ellington Field. The work includes removing existing annunciator panels, installing new fire alarm control panels, replacing non-compatible panels, and modifying existing alarm circuits as required. Increasing failures, repairs, and maintenance efforts are being experienced with the existing building fire alarm panels. The panels are approximately 26 years old, are no longer manufactured and spare parts are no longer available.

2. Repair Roofs, Various Buildings	450,000
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This project provides for replacing approximately 110,000 square feet of built-up roofing. The flashing at roof penetrations and perimeters will be replaced at all built-up roofing areas. The existing neoprene mechanical fastener securing the roofing material at building perimeters will be replaced with a metal gravel guard. In general, the work consists of complete removal of the deteriorated roofing and replacement with full roof sections. Buildings planned for repair are based on the most recent roof surveys and include buildings 5 and 37. These roofs were originally designed for a 20-year life expectancy and most were constructed in the 1963/64 time frame. The deteriorated conditions of these roof areas can no longer be restored by normal maintenance.

3. Repair of 15-kV Power Cable, Utility Tunnel.....	610,000
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This project provides for repair by replacement of electrical power feeders 2-6 and 2-11 in the utility tunnel system. The work includes the replacement of approximately 7,500 linear feet of 15-kV armored cable servicing buildings 4, 5, 7, 7A, 8, 9, 9A, 9B, 10, 11, 12, 49, 30A, 31, 33, 34, 35, 37, 46, and 49. This electrical power cable has been in continuous operation for over 20 years. Recently, numerous unscheduled outages have occurred because of faults in the cable system. Examination of the cable indicates that replacement is required to insure electrical power reliability to the critical facilities served by this system.

- | | |
|---|---------|
| 4. Repair Test Area Heating, Ventilating, and Air-conditioning Systems,
White Sands Test Facility..... | 740,000 |
|---|---------|

This project provides for the repair and/or replacement of the major heating, ventilating, and air conditioning (HVAC) and thermal conditioning systems in the propulsion test areas at the White Sands Test Facility. The project includes modifying HVAC systems that provide service to the test area blockhouses, test stands, test stand support building and data acquisition bunkers, and the propellant systems thermal conditioning equipment. The major portion of the propulsion test area's HVAC systems and propellant thermal-conditioning systems were installed in the early 1960's and have reached the end of their useful life.

F. <u>Kennedy Space Center</u> (KSC)	<u>\$3,270,000</u>
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- | | |
|--|---------|
| 1. Repair Pad B Compressed Air System..... | 470,000 |
|--|---------|

This project provides for the replacement of air compressors and associated equipment at LC 39 Pad B. Work will consist of demolition of two compressors and related hardware; installation of two (2) new compressors and new ancillary equipment such as filters, controls, reservoirs, dryer, cooling towers. The air compressors at both pads are very old and in need of replacement. The existing capacity of the compressors is marginal. Payload Checkout Room clean air requirements are beyond the present capability of the system. Waste oil discharge of the present system will be upgraded to Florida Department of Environmental Regulation and United States Environmental Protection Agency standards.

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| 2. Replace Operations and Checkout Building Roof, Office Area..... | g00,000 |
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Replace roof areas A, B, & C, which are the entire north portion of the building. Since its installation 15 years ago, weathering has caused breaks, splits, ridging, and intrusion of water into the roof. If no action is taken, water could enter the facility with resulting damage to ground support equipment.

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| 3. Repair Industrial Area 4-lane roads and 1 st Street..... | 530,000 |
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This project will provide for applying about 2,120 tons of asphaltic concrete leveling course to settled areas of the road and applying one-inch asphalt overlay. Includes approximately 58,000 lineal feet of pavement striping. The roads in the industrial area need repair due to deterioration which has occurred over the last 28 years.

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| 4. Repair LC-39 Pad B Roads..... | 500,000 |
|----------------------------------|---------|

This project will rehabilitate approximately 1.1 miles of two-lane bypass road and 3.2 miles of service and access roads within the Pad B perimeter fence. Approximately 575 tons of asphaltic concrete will be required as a leveling course for the bypass road. A 1-inch asphaltic concrete overlay will be applied to

approximately 60,544 square yards of pavement, and approximately 68,200 lineal feet of pavement striping will be applied. These roads provide access and service to all facilities within the pad area. The passage of time and heavy wear to the roads from heavy trucks, cranes and other Shuttle related equipment have worn and cracked the surface. This cracked wearing surface permits water to reach the road base causing additional road deterioration.

5. Repair Above Ground HTHW/LTHW Piping, Industrial Area..... 370,000

This project will refurbish the Industrial Area High Temperature Hot Water (HTHW) and Low Temperature Hot Water (LTHW) above ground distribution piping insulation and install a protective cable to prevent lawn mowing equipment from damaging the insulation. The existing insulation and its protective wrapper have been damaged and have deteriorated from the corrosive salt atmosphere.

6. Repair Cape Road from Cape Canaveral Air Force Station to Pad B..... 500,000

The project provides for repair of 5 miles of two-lane road. Approximately 1,800 tons of asphaltic concrete will be required as a leveling course. A one-inch asphaltic concrete overlay will be applied to approximately 72,000 square yards of pavement along with approximately 81,000 linear feet of pavement striping. This road was part of the original route from Cocoa Beach to Titusville and is about 34 years old. Settling and cracking are deteriorating the road base and wearing surface. Unless resurfacing is accomplished, deterioration will accelerate and the roadway will become hazardous and unusable to traffic.

- G. Langley Research Center (LaRC) \$3,510,000

1. Repairs to High Pressure Steam Distribution System, West Area..... 430,000

This project provides for repairs to the high pressure steam distribution system in the West Area of Langley Research Center. The work to be accomplished under this project includes the replacement of defective piping, valves, and fittings; the repair of defective welds; and radiographic inspection of the repaired welds. Completion of this project will ensure safe and efficient operation of vital research facilities.

2. Repairs to Electrical Switchgear, Various Facilities, West Area..... 470,000

This project provides for repairs to switchgear in buildings 1247D, 1212B, and 1251A. The work to be accomplished includes removal and replacement of all electrical/mechanical components internal to the existing circuit breakers within this switchgear. This project is necessary to replace obsolete parts and reduce maintenance time and costs.

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3. Repairs to 2400 Volt Power Feeder West Area..... 340,000

This project provides for repairs to the 2400 volt power feeder which serves 16 facilities in the West Area of Langley Research Center. The work to be accomplished includes the removal of high voltage splicing boxes; provision of new, fused oil load break and air break switches; new concrete pads for the switches; and new duct banks and feeders from existing manholes to new switches. Deterioration of cables and splice boxes is accelerating in this area. Repairs to this power feeder will provide a safe reliable power source for these 16 facilities.

4. Replace Transformer "1B" Stratton Road Substation..... 650,000

This project provides for the replacement of the "1B" transformer in the Stratton Road Substation. The work includes disconnecting and removing the existing transformer; modifying the foundation and overhead bus to accommodate the new transformer; and installing, connecting, and testing the new transformer. The existing transformer is 43 years old and has become unreliable as a regulated power source. Replacement of this transformer will ensure a dependable regulated power supply to vital research facilities.

5. Replace Roof, Advanced Machining and Development Shop (1225) 360,000

This project provides for the replacement of approximately 27,200 square feet of existing roofing on Building 1225. The existing roof will be removed and replaced with a new built-up roof. This new roof is needed to avoid damage to the building structure and prevent damage to the research equipment housed in the building.

6. Replace East-West Electrical Control Cable..... 610,000

This project provides for the replacement of the East-West electrical control cable which runs between the Back River Substation in the East Area and the Stratton Road Substation in the West Area. This cable is over 45 years old and is nearing its useful life. The work includes installation of approximately 19,000 lineal feet of shielded cable. The cable will be direct buried. This project will ensure a dependable power source to East Area facilities.

7. Replace Switchgear Taylor Road Substation (1147) 650,000

This project provides for the replacement of the 2400 volt switchgear in the Taylor Road Substation. This switchgear, which has become unreliable, is obsolete and contains circuit breakers which are no longer manufactured. The work to be accomplished includes disconnecting cables from existing loads and connecting them to a temporary power supply; removing the existing switchgear; installing the new switchgear; and connecting cables to the new switchgear. Replacement of this switchgear is essential to ensure a dependable power source to seven major facilities.

H. Lewis Research Center (LeRC) \$3,650,000

1. Repair Central Process Hydraulic Oil System..... 770,000

The work includes installation of a new 1,000 psi control oil system independent of the lube oil system and the replacement of pumps, supply lines, return lines, activators, accumulator, filters, a new reservoir with a heater and cooler, and associated control valves. The work will also include associated structural, electrical and mechanical system modifications as necessary. The current oil system is a combined control oil and lube system. The oil in the control oil system is presently contaminated by the bearings, seals, and atmospheric vents in the lube oil system. Operation of two independent systems will allow use of a more suitable grade of oil in each system and reduce contamination, maintenance and operation costs.

2. Repair Steam Trenches..... 460,000

This project provides for the repair and replacement of deteriorated concrete steam trenches, steam system piping and components, and paving. The repair areas include Taylor Road from the south intersection to the north intersection of Durand Road, and a small area at Building 54. Roadways will be excavated, trench covers will be removed, concrete trench and manholes will be repaired, trench drainage will be improved, condensate piping and steam insulation and components will be replaced, new concrete covers will be installed, and roadways will be resurfaced with new asphalt paving. Recent inspections have disclosed collapsed sections of trench and roadway; severe concrete deterioration due to road salts and freeze-thaw cycling; advanced corrosion of condensate piping and pipe supports due to the trench environment; and poor condition of steam line insulation, valves, and expansion joints. The project will provide safe, reliable steam service to critical research buildings.

3 Repair 138 KV Equipment, Substation A..... 650,000

This project provides for the repair of the Substation A, Building 200, 138 kv high voltage system to ensure safe and reliable electric service to LeRC. The work includes replacing 138 kv disconnect switches and surge arrestors, repairing breaker operating mechanisms, and replacing associated equipment. The present load demand is approaching the power system's full capacity and the potential system fault levels exceed equipment ratings. This project will improve the power system's safety and reliability and will reduce annual maintenance costs by eliminating difficult to replace parts.

4. Repair 34.5 KV Equipment, Various Substations..... 590,000

This project provides for the repair of 34.5 kV equipment at various substations at LeRC to ensure safe and reliable electric service to all research facilities. The work includes replacing switches, repairing bus insulation, replacing breakers and foundations, and replacing associated equipment. The present system requires extensive annual maintenance and has been experiencing failures. In addition, potential fault levels exceed equipment ratings. This project will improve system reliability and safety and will reduce annual maintenance costs by eliminating the need for difficult to obtain replacement parts.

5. Repair Central Water Distribution System..... 590,000

This project provides for the replacement or cleaning/relining of corroded and plugged water mains located along Taylor Road and the South area roads. It also includes the replacement or cleaning/relining of the service pipes from the street main to the various buildings along Taylor Road and the south area roads. Other work in this project includes miscellaneous mechanical and civil work as necessary. This project is the first element of a multiyear program to increase domestic water pressure and water quality. Low pressure due to deterioration of the inside of water pipes has been a problem at LeRC.

6. Repair Water and Natural Gas Systems, Plum Brook..... 590,000

The work in the project includes replacement of domestic water piping, natural gas piping, and repair or replacement of inoperable valves. These systems are 50 years old and require continual maintenance. Currently the Hypersonic Tunnel Facility, K-site, B-2, and the Space Power Facility are being reactivated to support major NASA test programs. A reliable domestic water system is required for process systems and potable water needs.

I. Marshall Space Flight Center (MSFC)..... \$1,880,000

1. Repair Roof of Laboratory and Office Building..... 540,000

This project provides for the replacement of the roof on the Laboratory and Office Building (4487). The scope includes replacement of approximately 75,000 square feet of roofing membranes, installation of a light weight R-30 roof insulation system, selective replacement of flashing, and the removal of unnecessary expansion joints and vents. The existing roof has already exceeded its life expectancy and is very deteriorated. Repair of this roof will preserve the integrity of the facility, reduce maintenance costs and provide energy cost savings.

2. Repair Deck of Building 4200..... 600,000

This project provides for the repair of the terrace deck surrounding Building 4200. The deck functions as a roof to the basement area where a severe water infiltration problem exists because of the deteriorated condition of the deck. This project will strip the deck down to the structural members and reconstruct it with an upgraded moisture proofing system. The need for this repair is critical since a number of equipment-intensive functions such as the computer room, the reproduction room, and the mechanical equipment room are housed in the basement of this building.

3. Repair Roads and Paved Areas.. 740,000

This project provides for the repair and resurfacing of approximately **120,000** square yards of deteriorated roads, parking areas, and hardstands. The scope includes repairing damaged base course, application of tack coats, overlaying with asphaltic paving and/or seal coat, and painting parking stripes and road markings. These road surfaces and hardstands provide primary access to key test, development, and production facilities.

J. Michoud Assembly Facility (MAF)..... **\$2,710,000**

1. Repair Building **102**, Second Floor, East End..... 845,000

This project provides for the repair of the interior systems of the Engineering Building (102) on the east end of the second floor. The scope includes replacement of the supply/return duct work, electrical distribution/cabling system, existing acoustical ceiling/lighting system, and modification of the overhead sprinkler and fire alarm systems. This building is over **40** years old and has never received a major interior building restoration. These repairs are required to provide an adequate workplace environment.

2. Repair Building **101**, Second Floor, East End..... 730,000

This project provides for the repair of the interior systems of the Administration Building (**101**) on the east end of the second floor. The scope includes replacement of the supply/return duct work, electrical distribution/cabling system, existing acoustical ceiling/lighting system, and modification of the overhead sprinkler and fire alarm systems. This building is over **40** years old and has never received a major interior building restoration. These repairs are required to provide an adequate workplace environment.

3. Repair Cooling Towers..... 550,000

This project provides for the repair of two multi-cell cooling towers (**127, 352**) which provide cooling water to Buildings **110, 114, 130, 131, 350, 351**, and the Chemical Tank Farm. The scope includes replacement of fans and shrouds, water nozzles, piping and valves, rotten structural members, decking and casing, air intake screens, and fire system piping and components. The project also provides a new **625-ton**, single-cell tower with associated support equipment to supplement Tower **352**, which is undersized to meet the required cooling load. The existing towers are over **25** years old and have never been overhauled.

4. Repair Hot Water and Steam Systems..... 585,000

This project provides for the repair of the hot water and steam systems in Buildings **320** and **351**. The scope for Building **320** includes replacement of two reheat water boilers, two domestic hot water boilers, one storage tank, and ancillary equipment. The scope for Building **351** includes replacement of one hot water boiler, one steam boiler, one condensate receiver, and ancillary equipment. These systems are over **25** years

old and have never been overhauled. Corrosion of components is prevalent and replacement parts are difficult to obtain. Repair of these systems will significantly reduce maintenance costs and improve efficiency and reliability.

K. <u>Stennis Space Center (SSC)</u>	<u>\$1,425,000</u>
1. Replace Components of the High-pressure Gas System.....	650,000

This project provides for the replacement of various high-pressure gas system components in the Space Shuttle Main Engine (SSME) test complex. The existing components are over 27 years old and have become unreliable as a result of their extended service life. They require frequent maintenance, and replacement parts are difficult to obtain. Each component failure causes significant disruptions to the on-going SSME test program.

2. Repair Marine Docks and Dolphins	440,000
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This project provides **for** the repair **or** replacement of the marine docks and dolphins throughout the Center's water canal system. The canal system is used for propellant transfer and barge movements in support of the Space Shuttle Main Engine test program. The marine docks and dolphins have been in place **for** over 25 years and many are in poor condition. The proposed repairs are required to improve the maintainability of the docking system and to preserve the safety associated with the movement of propellant barges **and** the propellant transfer operations.

3. Repair Electrical Busway Systems.....	335,000
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This project provides for the replacement of the electrical busway systems in the Repair and Fabrication Shops of the Site Maintenance Building (2201) and the Test Maintenance Building (2205). These busway systems supply power to all the Facility Operations and Support contractor shops. The busway equipment is very old, has become obsolete, and replacement parts are no longer available. Failures in the bus ducts have created power losses in critical areas and caused significant operational downtime. Replacement of the busways is required to improve the maintainability and reliability of the electrical system and to reduce the operational downtime of the contractor shops.

L. <u>Wallops Flight Facility (WFF)</u>	<u>\$2,500,000</u>
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1. Repair Seawall.....	700,000
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This project provides for the repair of the Wallops Island seawall to protect the central area south of Pad 3 and associated facilities. The construction will be seaward of the existing seawall and include all necessary toe protection. This work is necessary to prevent **or** minimize storm damage which is becoming increasingly common due to beach erosion and deterioration of the existing protection system.

2. Repair of Runways 10/28 and 4/22..... 900,000

This project provides for a 2-inch bituminous concrete overlay covering an area of 3,000 feet by 200 feet on runway 10/28, and 1,660 feet by 104 feet on runway 4/22, replacement of all paint markings removed during construction, cleaning and resealing of cracks, and the placement of a fabric reinforced system for crack control. Runway 10/28 is the most active runway due to prevailing winds east to west. Longitudinal and transverse cracks are in evidence and through use and time, extensive repair is required. Runway 4/22 is a research runway which includes the Microwave Landing System (MLS), grooved surfaces, damming for hydroplaning, leader cable for ground guidance and a high speed turn-off.

3. Repair Paved Surfaces..... 900,000

This project provides for the repair of concrete and paved surfaces at Wallops Main Base. Various streets, service courts and parking areas require repair or alteration where substandard surfaces exist. The work includes 75,000 linear feet of concrete and joint repair; 22,500 square yards of stone surface treatment; placement of 51,000 square yards of 1-1/2 inches bituminous concrete overlay; and placement of 400 square yards of new asphalt concrete pavement.

M. Various Locations..... \$560,000

1. Repair of Coolant Distribution System, DSS-14, Goldstone, California. 560,000

This project provides for the replacement of worn out and obsolete components of the 70-meter antenna high power coolant system. These items include the fiberglass piping, the water purification system, the main pump assemblies and associated piping, the control valves, the motor starters, and the control logic. The fiberglass piping on the 70-meter antenna has proven unreliable and requires excessive maintenance. In addition, all the major components of the system are outdated and have been used beyond their normal useful life. An upgrade of the system is required to replace obsolete equipment with current technology. This will improve the overall system reliability and reduce maintenance.

MISCELLANEOUS PROJECTS NOT IN EXCESS OF \$250,000 EACH. \$1,165,000

Total \$31,700,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$34,000,000 to \$38,000,000 per year will be required for continuing repair needs.

REHABILITATION
AND MODIFICATION



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

SUMMARY

Rehabilitation and Modification

Summary of Project Amounts by Location:

	<u>Amount</u>	<u>Page No.</u>
Ames Research Center.....	\$2,600. 000	CF 12-2
Dryden Flight Research Facility.....	720. 000	CF 12-3
Goddard Space Flight Center.....	2,800. 000	CF 12-4
Jet Propulsion Laboratory.....	2,450. 000	CF 12-5
Johnson Space Center.....	3,025. 000	CF 12-6
Kennedy Space Center.....	3,450. 000	CF 12-7
Langley Research Center.....	3,370. 000	CF 12-8
Lewis Research Center.....	4,090. 000	CF 12-9
Marshall Space Flight Center.....	3,515. 000	CF 12-10
Michoud Assembly Facility.....	1,475. 000	CF 12-12
Stennis Space Center.....	2,390. 000	CF 12-12
Wallops Flight Facility.....	1,980. 000	CF 12-13
Various Locations.....	1,790. 000	CF 12-14
Miscellaneous Projects Not in Excess of \$250,000 Each.....	<u>1,045. 000</u>	CF 12-14
Total.....	<u>\$34,800. 000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Rehabilitation and Modification of Facilities, Not In Excess of \$1,000,000 Per Project

INSTALLATION: Various Locations

FY 1992 CoF Estimate: \$34,800,000

FY 1990: \$34,998,000

FY 1991: \$34,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for the rehabilitation and modification of facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in this request are those facility rehabilitation and modification needs for FY 1992 that have been fully identified at the time of the submission of these estimates and are estimated not to exceed \$1,000,000 per project. The purpose of this program may include some restoration of current functional capability but also includes enhancement of the condition of a facility **so** that it can more effectively accomplish its designated purpose or increase its functional capability.

PROJECT JUSTIFICATION:

Based on the initial investment costs, the NASA Capital Type Property totals approximately \$7.9 billion of which the physical plant comprises some \$4.3 billion. A continuing program of rehabilitation and modification of these facilities is required to accomplish the following:

- a. Protect the capital investment in these facilities by minimizing the cumulative effects of wear and deterioration.
- b. Ensure that these facilities are continuously available and that they operate at peak efficiency.
- c. Improve the capabilities and usefulness of these facilities and thereby mitigate the effects of obsolescence.
- d. Provide a better and safer environment for all personnel.

This program includes only facility rehabilitation and modification work having an estimated cost not in excess of \$1,000,000. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance or by related routine facility work efforts that are provided for in other than CoF estimates.

PROJECT DESCRIPTION:

Proposed rehabilitation and modification projects for FY 1992 totaling \$34,800,000 are described under "PROJECT COST ESTIMATE." The total program of \$34,800,000 has been distilled from requests of approximately \$66,000,000 and represents only a modest request in relation to the backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are the highest priority requirements. Deferral of this mission-essential work would adversely impact the availability of critical facilities, program schedules, and energy conservation objectives. Only those projects estimated to cost not in excess of \$250,000 have not been individually described or identified by center. The total cost of these miscellaneous projects is \$1,045,000.

During the course of the year, some rearrangement of priorities may be necessary. This may force a change in some of the items to be accomplished. Any such change will be accomplished within available resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE:"

a. Utility Systems.....	\$ 7,130,000
b. Fire Detection/Protection Systems.....	3,875,000
c. General Purpose Buildings.....	6,275,000
d. Technical Buildings/Structures	16,850,000
e. Pavements and Drainage.....	670,000

PROJECT COST ESTIMATE:

A. <u>Ames Research Center</u> (ARC).....	<u>\$2,600,000</u>
1. Rehabilitate and Modify Fire Detection and Suppression System, (N-211).....	730,000

This project provides for modification of the Fire Detection and Suppression System in the main ARC hangar by providing heat detection and wet pipe sprinklers in unprotected areas of the building, automatic controls for the aqueous foam fire suppression systems in hangar and shop areas, and rehabilitation of fire alarms and enunciators throughout the building. The existing system is **so** unreliable, the deluge system protecting the hangar requires manual activation. High-value experimental aircraft and personnel are in the hangar and a system upgrade is required to provide continued protection.

2. Rehabilitate and Modify Air Conditioning System, (N-243)..... 750,000

This project provides for replacement of water chillers in the Flight and Guidance Simulation Laboratory Building, and includes piping and valving to provide parallel flow operations, replacement of chilled water coils, and sensors and controls to tie the system to the ARC Facilities Management and Control System. The current chiller system cannot support increased loads caused by additional computers used for simulation research and by increased personnel. This leads to loss of capability during warm weather periods. In addition, major research programs must be shut down for maintenance of equipment.

3. Rehabilitation of the 20-G Centrifuge Research Facility, (N-221A)..... 720,000

This project provides for replacement of the control/safety system; rehabilitation of the motor drive system and boom; upgrade of control, monitoring, and transmission systems; and provision of test preparation room and shops. This man-rated centrifuge is 24 years old, and the centrifuge arm and drive system are worn out. The control systems, based on vacuum-tube technology, are becoming more difficult to maintain. The centrifuge is needed for a wide range of artificial gravity studies, and rehabilitation now will extend its life by 10-20 years.

4. Modify Building N-242 for Elevators 400,000

This project provides for installation of a 4000-lb capacity elevator in the Vestibular Research Building to replace a manual hoist system. The project will also provide modifications to the second floor for handicapped access. Installation of the elevator will provide a safe means of transporting personnel and equipment to the second floor. Currently, most furniture and equipment are too large for the hoist, and must be hand-carried to the second floor. In addition, there is no wheelchair access to the second floor of the building.

B. Dryden Flight Research Facility (DFRF)..... \$720,000

1. Modify Heating, Ventilating, Air Conditioning and Fire Suppression Systems, Buildings 4801/4802. 720,000

This project provides for installation of evaporative coolers in the Aircraft Construction and Modification Hangar (4801), and in the Main Hangar (4802) and for conversion of the existing deluge systems in the hangar portion of Building 4801 to foam-water deluge systems. These facilities are currently heated but not cooled. High outside temperatures in the summer cause interior temperatures to exceed 100 degrees on a routine basis. On most days, these hot interior temperatures cannot be dissipated by opening the hangar doors due to high winds outside. These high interior temperatures are detrimental to highly sensitive aircraft instrumentation and degrade worker productivity. Installation of evaporative coolers will reduce interior temperatures to an acceptable 85 degrees Fahrenheit. In addition, the deluge system provides no capability for manual fire-fighting, and the floor drain system is not adequate to protect the building from water damage if the deluge system is activated. A fire could lead to major facility damage.

C. <u>Goddard Space Flight Center</u> (GSFC).....	<u>\$2,900,000</u>
1. Modifications to Buildings 22 and 25.....	700,000

This project provides for the renovation of approximately 6,000 square feet in Building 25 and approximately 11,400 square feet in Building 22. The Building 25 work will reconfigure the existing Source Evaluation Board (SEB) and training areas in the basement of the facility for use as Data Evaluation Laboratory, Equipment Development Facility, Transportable Payload Operations Control Center Development Facility, and Flight Operations Team support areas. The facility modifications in Building 22 are required to recapture space resulting from the relocation of the Materials Branch to the new Quality Assurance and Detector Development Laboratory. Modifications will include new ceilings, interior partitions, light fixtures, smoke detection systems, sprinkler systems, HVAC upgrades and modifications to the building's electrical systems to support the installation of new ADP equipment.

2. Modifications for Optical Surface Preparation Facility (5).....	730,000
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This project provides for the modification of approximately 1,300 square feet of existing space previously occupied by the Electro-Plating Facility in the Instrument Construction and Development Laboratory, Building 5. Modifications of floors, ceilings, lighting, heating, ventilating and air-conditioning systems are included to prepare the space for installation of acid polishing equipment. Included in the project are provisions for soils testing and refurbishment of existing structural systems and painted surfaces of the old plating shop. Acid-polishing serves to relieve mechanical strain induced during optical component manufacture. The acid-polishing process also facilitates deposition of metals on to optical surfaces thereby enhancing reflection and is also used to clean mirrors prior to vacuum deposition. Current facilities are not capable of processing new larger optical components. A specialized facility is needed to safely handle the quantities of acid required to process these larger components.

3. Rehabilitation and Modification, Building 18.....	670,000
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This project proposes the modification of approximately 10,500 square feet of space in Building 18. Modifications include the construction of a mezzanine approximately 3,300 square feet in area over the current location of the Information Technology Center. An exterior stairway will be constructed along the south elevation of the building to provide access to and egress from the second floor. The second floor bathrooms will be expanded. Rehabilitation of the HVAC system is required due to age and deterioration. Additional modifications include replacement of partitions, replacement of obsolete metal pan and/or surface mounted ceiling systems, replacement of obsolete fluorescent light fixtures, replacement of worn or obsolete floor tiles, repainting of existing walls/partitions, and extension of sprinkler heads. This work is required to bring this 27-year-old administrative/support facility up to current building standards.

4. Modifications for Integrated Flight Software Development Facility (14).....	300,000
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This project provides for the renovation of 4,000 square feet in Building 14 to house the Integrated Flight Software Development Facility. The modifications will include replacing 4,000 square feet of ceiling tile, light fixtures, smoke detectors and sprinklers. Modifications also include new raised flooring and the upgrade of HVAC and electrical service. This project is required to consolidate, expand and enhance the Flight Data Systems Development Integration Center to provide continued flight software development support.

5. Rehabilitation and Modification of Mission Operations Facility Buildings 3/14..... 500,000

This project provides for the modification of 8,400 gross square feet of the mission operations area of the Building 3/14 complex. This includes new partitions and replacement of ceiling tiles, light fixtures, and raised floor tiles. Provisions will also be made for HVAC modifications, fire protection and detection, and upgrading electrical service as well as cable pulls. These modifications will accommodate mission support systems and personnel housing for space missions. The facility supports project readiness and systems development activities in support of space missions.

D. Jet Propulsion Laboratory (JPL)..... \$2,450,000

1. Modification of Power Control Console, Space Flight Operations Facility (230) 900,000

This project would replace the 25-year-old Powerplant Control Console in the Space Flight Operations Facility's (SFOF) emergency power generation room. This project would replace obsolete and unduly complex facility instrumentation and controls, improve operational reliability and training procedures, and permit substantial manpower efficiencies over the current manual recording procedures for operational data (temperatures, pressures) describing the facilities performance. These modifications are necessary for reliable emergency power in the SFOF which supports all NASA planetary exploration missions.

2. Modifications for Environmental Test Laboratory (144) Bakeout Facility..... 650,000

This project proposes modifications to the existing 10' diameter by 10' long horizontal vacuum chamber in the Environmental Test Laboratory, Building 144, to provide "bakeout" capability. The project includes removing the existing aluminum helium and liquid nitrogen shrouds and replacing them with a stainless steel version designed for a temperature range of up to 300 degrees Fahrenheit. The JPL Environmental Test Laboratory currently has "bakeout" capability in only one 30-inch diam by 50-inch long vacuum chamber. This chamber is too small to accommodate large test articles scheduled in this facility. The 10' diam by 10' long chamber, identified for modification in this project, currently has only the capability of temperature control in the range of -185 degrees Centigrade to +125 degrees Centigrade. This modification will provide the required "bakeout" capability, to attain the stringent criteria of "cleanliness" for current and future flight projects.

3. Modifications for Contaminant Control, Cryogenics/Glass Fabrication Building (157) 900,000

This project proposes the modification of the first floor of Building 157 into laboratories for contamination control, glass fabrication and cryogenics research. This floor, which is 8,000 square feet, will be modified to house approximately 5,375 square feet of laboratories and support areas. The laboratories will contain class 10,000 cleanrooms with class 100 clean enclosure within, including the required auxiliary chiller, air handlers and air distribution. Also included are exhaust hoods and discharge air scrubber, a fume hood and exhaust fan, an acid workstation with tank exhaust and dilution tank, an eye wash and piping for laboratory gases. The existing non-structural partitions and ceilings will be removed to accommodate the modifications. The existing mechanical, electrical and plumbing systems will require modifications to support new laboratories. The above research activities are now housed in Buildings 78 and 113 which are 30 years old and are scheduled for demolition.

E. <u>Johnson Space Center</u> (JSC).....	<u>\$3,025,000</u>
1. Modifications for Equipment Upgrade (5 and 30)	800,000

This project provides for modifications to the Mission Simulation and Training Facility, Building 5, and the Mission Control Center, Building 30, to support planned equipment consolidations and upgrades within these vital facilities. Included are: installation of additional electrical power distribution equipment; modifications to the existing air-conditioning system; communications cable rerouting; and miscellaneous architectural wall, floor, and ceiling system modifications. Existing ADP support equipment and systems have reached the point of obsolescence.

2. Rehabilitation of Fire Alarm System, Hangar 150, Air Force Plant 42, Palmdale, CA.	600,000
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This project provides for rehabilitation of the existing fire alarm system and the installation of a new fire alarm system complete with a new control panel, detectors, manual pull boxes and audio/visual devices in Hangar 150, Air Force Plant 42, Palmdale, CA. The detection system will be tied into the Air Force Plant 42 Central System. The existing fire alarm system is obsolete and provides limited detection capability. Hangar 150 is the final assembly and restoration point for Space Shuttle Orbiters and must be adequately protected.

3. Modifications of Antenna and Tracking Development Lab (14).....	425,000
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This project provides for modifications within the Antenna and Tracking Development Laboratory, Building 14. In the existing Tracking Test Bed Laboratory, which is used to provide dynamic modeling for system development of components related to Satellite Servicing System Flight Demonstration, Extravehicular Activity Retriever (EVAR), and Lunar/Mars projects, the floor will be flattened to permit accurate, dynamic testing of docking, proximity operations, and robotic sensors. Presently, the floor is uneven and causing testing inaccuracies. In addition, two new laboratories will be established. The High Temperature Superconducting and the Microwave Integrated Circuits Laboratories in Building 14 are required to support research and program related responsibilities at JSC.

4. Installation of Automatic Sprinkler System (1).....	600,000
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This project provides for the installation of an automatic sprinkler system in Project Management Building 1. The work includes the installation of sprinkler piping and heads, piping modifications, and connection to the fire protection riser piping on floors 5 through 9. The existing riser piping and fire pump will be used after this modification. Spot removal of asbestos will be accomplished for installation of pipe hangers. This method is the most economical way to provide the level of fire safety required by National Fire Protection Association standards for this nine-story office building.

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5. Installation of Automatic Sprinkler System (45)..... 600,000

This project provides for the installation of an automatic sprinkler system in the Project Engineering Office Building, Building 45. The work includes the installation of sprinkler piping and heads, piping modifications, and connection to the fire protection riser piping on floors 2 through 7. The existing riser piping and fire pump will be used after this modification. Spot removal of asbestos will be accomplished for installation of pipe hangers. This method is the most economical way to provide the level of fire safety required by National Fire Protection Association standards for this seven-story office building.

F. Kennedy Space Center (KSC)..... \$3,450,000

1. Rehabilitate Banana/Jay-Jay Railroad Bridges Electrical Control Systems..... 550,000

This project replaces the existing magnetic amplifier controllers for the Banana River Bridge and Jay Jay Railroad Bridge with new variable speed motors and programmable controllers. The project includes replacement of related limit switches and console disk. The existing control system is very old and spare parts are not readily available. Spare parts must be made to order, are very costly and require long lead procurement. These replacements are necessary to maintain operation and reliability of these bridges.

2. Modify VAB Low Bay Area for Orbiter Experiments Storage and Processing..... 470,000

Modifications to the vehicle assembly building (VAB) cell 8 are required to provide a new orbiter experiments (OEX) storage and processing area. Cell 8 requires extensive modification including enclosure, air conditioning, and security additions to provide an environmentally clean and secure area. Orbiter experiments (OEX) must be stored and processed in a facility that meets stringent temperature, humidity and cleanliness standards. Such a facility is not presently available.

3. Upgrade Railroad Mainline, Jay-Jay to Rotation Processing Serving Facility..... 750,000

This project provides for upgrading the railroad mainline by replacing the existing 100-pound section rail (bolted joints) with new 132-pound weldrail. Approximately 2.5 miles and four new switches will be provided. KSC mainline rail system is structurally marginal for solid rocket motor segment rail cars (250 ton). Replacement of existing rail will increase load carrying capacity and decrease rail wear and maintenance requirements.

4. Modify Potable Water Line at Mobile Service Structure Park Site..... 335,000

This project provides for installation of a new 18" potable water line around the Mobile Service Structure (MSS) Park Site and connects to existing fire hydrants within the park site. The existing line will be abandoned in place. The existing pipeline running under the crawlerway and the MSS parksite does not meet pipe wall thickness standards. Excessive corrosion within the pipeline has occurred at several locations along the Saturn causeway. This pipeline supplies water to Pad A, Pad B, and the Cape Canaveral Air Force Station during emergency situations. A waterline rupture would cause temporary disruption to Pad A, prolonged disruption to Pad B, and preclude emergency capability for Cape Canaveral Air Force Station.

5. Upgrade Industrial Area Fire Alarm Panels and Modems..... 485,000

This project provides KSC with a central fire alarm system by linking approximately 100 alarm points via a remote monitoring and control system. The existing KSC fire alarm control and monitoring system (FACMS) does not permit the KSC fire service to effectively respond to alarm situations. The existing system is a slow telegraphic system which, in the case of simultaneous alarms, completely suppresses all but one Fire alarm signal at a time. Fire service response for the second alarm would be delayed resulting in increased facility damage and greater risk of injury to personnel.

6. Modify Vertical Processing Facility (VPF) Fire Detection/Suppression Subsystem..... 400,000

This project would install a new "state-of-the-art" fire detection/suppression system. The system would include separate fire spray nozzles for personnel and property (payload) protection. The new system would prevent inadvertent activation. The VPF is currently equipped with a water deluge fire suppression system which poses a potential of inadvertent discharge to payload(s) and equipment. The VPF does not have an automatic fire detection system. Serious and significant damage may result to payloads and the facility if improvements are not implemented.

7. Upgrade Explosive Safe Area-60 Fire Protection Systems..... 460,000

This project provides for replacement of the fire protection systems in the S and A lab and dynamic balance lab at Explosive Safe Area (ESA)-60, Cape Canaveral Air Force Station. Work consists of replacing piping, valves, pumps, controls, and miscellaneous components of the fire protection system. This project is required to improve system reliability and to decrease the possibility of inadvertent water discharge. Water may cause serious damage to contents of the facility.

G. Langley Research Center (LaRC) \$3,370,000

1. Modifications to the High Reynolds Number M6 Tunnel (1247D) 900,000

This project includes upgrades of the model injection system, the fabrication and installation of a three axis flow-field survey mechanism capable of manual or automatic control, and upgrade of the tunnel control room. The existing model injection mechanism will be modified from pneumatic actuation to hydraulic actuation for more accurate model positioning. The new flow-field survey mechanism will be contained in a new pressure box mounted on top of the tunnel test section and will provide three dimensional tracking capabilities. The new flow-field survey system will have manual or automatic control functions and the capability of interfacing with an existing computer. These modifications will allow pinpoint accuracy of probe location during flow field surveys, and circumvent the current uncertainties associated with extrapolation. The research capabilities of this facility will be significantly improved.

2. Modifications to the Jet Noise Laboratory for Forward Flight System (1221A) 900,000

This project provides the modifications for the installation of research furnished hardware which comprises the Forward Flight System. These modifications include the construction of foundations; installation of the high speed blower and motor; the construction of a motor housing; the installation of an electrical unit substation; modifications and the installation of the dampers, louvers, filters, duct, nozzle,

burner and stand; modifications to the processing piping systems; modifications to the exhaust stack, including the installation of additional suction fans; and the installation of instrumentation and controls associated with the operation of the Forward Flight System. The existing facility can provide data on noise suppression for static conditions only. The addition of the Forward Flight System will allow testing of suppression concepts from a simulated idle on the taxi way through take off and climb to altitude in supporting NASA's High Speed Research Program and the technology development effort for the high speed civil transport aircraft.

3. Modifications to the Jet Exit Test Facility (1234)..... 680,000

This project upgrades the facility for increased mass flow rate of the high pressure air supply system to provide for dual flow test capability. The work to be done includes the installation of a higher capacity pressure reducing station, filter, and relief valve; and the installation of a second high pressure air supply to the test cell. This project increases the thrust and maneuver capabilities of the facility and insures continued progress in propulsion research.

4. Rehabilitation of Space Technology Laboratory (1232)..... 890,000

This project provides for the rehabilitation of approximately 25,000 square feet of office and laboratory space. The work to be done includes installing new ceilings and lights; refurbishing interior walls and doors; upgrading rest rooms, HVAC Systems, and electrical power distribution systems; and providing handicap access to the building and rest rooms. The building components are over 20 years old and have become severely deteriorated. This project will correct substandard conditions, reduce maintenance, and ensure the continued and efficient use of this facility in support of research programs.

H. Lewis Research Center (LeRC)..... \$4,090,000

1. Rehabilitation of Pumping System, Zero-G Facility (110)..... 700,000

This project provides for the rehabilitation of vacuum pump support systems and control room modernization at the zero gravity facility (110). The work includes the rebuilding/replacing of the drop chamber vacuum pumps, the associated valves and actuators, and the upgrading of the vacuum controls and instrumentation. Rehabilitation of the pumps and associated process systems will reduce the maintenance downtime requirements therefore, enabling the Zero Gravity Facility to increase its present research capabilities. Also, modernization of the existing control room instruments, camera and lighting systems, and annunciation panels will reduce safety and research accuracy problems associated with the existing, outdated instrumentation.

2. Modifications for Life Safety, Buildings (54 and 55)..... 520,000

This project provides for modifications to the 8x6 Supersonic Wind Tunnel Office and Control Building (54) and Communications Laboratory Building (55) to meet life safety requirements. The work includes installation of one-hour fire rated stairwell enclosures, ceiling modifications, new emergency doors, exit signs, additional smoke detectors, and emergency lights in each building. Other work includes necessary architectural, structural, electrical and mechanical modifications. This project will provide the building modifications necessary to meet handicapped access and life safety requirements.

3. Modifications to Utility Control System..... 700,000

This project provides for the modernization of the existing Utility Control System (UCS). The work includes installing a new state-of-the-art central control station, upgrading field interface devices and sensors, and providing additional field sensors and controls. The existing UCS consists of obsolete hardware that has become unreliable and expensive to maintain. This project will provide for the replacement, upgrade, and expansion of this equipment to obtain a more reliable system.

4. Rehabilitation of Mechanical Systems, Building (86)..... 700,000

This project provides for the rehabilitation of the mechanical systems in Building 86. The work includes the removal of the existing fan coil units, installation of new fan coil units, and replacing the zone control pumps and control system. The existing system is over 30 years old and the maintenance costs have risen to an unacceptable level. The present HVAC zone control is ineffective, producing problems maintaining environmental conditions. Replacement of fan-coil units, controls and pumps will provide an efficient and effective system and eliminate high maintenance costs.

5. Modify West Area Road..... 670,000

This project provides for the widening of the West Area Road pavement from 200 ft. south of Cryogenic Road to Cedar Point Road, and the construction of a storm sewer extension. Paving will include widening the asphalt pavement to 40 ft., with a median island for security guards. The project will also consolidate four gates on Cedar Point Road into a single location. Storm drainage along the West Area road south of the Photovoltaic Test Facility, Building 311, consists of roadside ditches with culverts at intersecting roads. This project will replace roadside ditches with pipe and inlets, thereby reducing the maintenance, improving the safety of the road, and resulting in more usable land area. The existing pavement is a substandard 20 ft. wide pavement with narrow one ft. berms and deep roadside drainage ditches immediately adjacent to the berms. The existing built-up pavement has very little structural integrity.

6. Rehabilitation of Altitude Test Chambers, Electric Propulsion
Research Building (EPRB) (16)..... 800,000

This project rehabilitates five altitude test chambers in the EPRB and includes replacement, modernization and addition of various instrumentation, relays, programmable controllers, graphic and annunciator panels, vacuum gate valves, blower/roughing pumps, oil diffusion pumps and wiring. The chambers are approximately 25 years old. Mechanical components need replacement, and instrumentation and controls need modernization to improve space simulation testing/scheduling.

I. Marshall Space Flight Center (MSFC)..... \$3,515,000

1. Modifications to the Test Area Warning Systems..... 745,000

This project replaces the area warning control system in the West Test Area and restores and modernizes the one in the East Test Area to establish centrally controlled systems. The warning systems need to be upgraded to ensure better safety control due to the increased number of personnel and vehicular traffic

in the test areas. The central system would furnish, upon demand of each test site, proper application of visual, oral, and/or aural warnings, plus a remote means of physically blocking roads (swinging arm type road blocks) to control access to individual test positions.

2. Modifications to Power Distribution System..... 745,000

This project installs a **1500-KW**, 4160-volt, 3-phase Power Distribution Module to provide backup electrical power for the chilled water system supporting the computers in the Huntsville Operations Support Center (4663). A concrete pad with engine/generator and above ground tank will also be provided. In the event of a failure of the commercial power sources, cooling water temperatures in the computer operating range could not be maintained and engineering support for launches and payload operations control functions would be jeopardized. All other systems in this facility already have backup engine/generator power supplies.

3. Rehabilitation of Ventilation Systems..... 665,000

This project restores the ventilation systems in the Surface Treatment and Plating Facility (4760). Scope includes restoration or replacement of air handling units, electric motors, metal air ducts, and concrete tunnels and liners. This facility is one of the largest of its kind in the region and is heavily used in support of in-house research and development programs. The corrosive nature of the processing environment has deteriorated the ventilation systems which must now be restored in order to comply with EPA and safety regulations. The last major overhaul of these systems was in the late 1960's.

4. Modifications to the Hazardous Structural Test Facility..... 740,000

This project restores and modernizes the Hazardous Structural Test Facility (4572). This facility is very deteriorated and is not equipped with a properly configured environmentally controlled computer area. Project scope includes replacement of the air conditioning units, repair of the roof, repair or replacement of one of the elevators, reconfiguration of the computer room, installation of a raised computer floor, installation of a fire suppression system, upgrade of the electrical service and of the work-area lighting, and resurfacing of the parking lot. This facility is unique in its size and adaptability, and is considered critical in support of multi-program hazardous testing of large space vehicle structures.

5. Rehabilitate and Modify Parachute Refurbishment Facility..... 620,000

This project provides for the restoration and modification of the Solid Rocket Booster Parachute Refurbishment Facility at Kennedy Space Center. Scope includes replacement of roof, cooling tower with associated pumps and controls, expansion tank with associated piping, chilled water pump, air compressors, and reconfiguration of current storage area to a process area. Project will also provide an additional 5,000 square feet of storage area outside of the process area proper. This facility has become maintenance intensive as a result of continuous roof leaks and has a high rate of mechanical system component failures. Relocating the storage area outside of the process area will bring the facility in compliance with safety and fire codes; converting the space made available by this action into additional process area will increase in-house operations capabilities and save approximately \$100,000 per year in production costs.

J. <u>Michoud Assembly Facility (MAF)</u>	<u>\$1,475,000</u>
1. Rehabilitate South Chilled Water Supply Piping.....	740,000

This project provides for the restoration of the overhead chilled water supply lines serving the south side of the External Tank Manufacturing Building (103). These lines are severely deteriorated. Wall thickness of the piping has decreased by 50 percent in some areas, supply pressure is inadequate at the end of the piping system, available valves are insufficient for isolation during outages, and the inaccessibility of the lines limit repair activity. In addition to Building 103, the South Chilled Water System also provides HVAC environmental control for other production related buildings such as the Vertical Assembly Building and the High Bay Facility.

2. Modify Substation No.9	735,000
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This project provides for the installation of two 750 kVA substations, each containing a foundation, a fencing enclosure, a high voltage switch, a 750 kVA transformer with low voltage switchgear, and feeders connecting from the switchgear to the equipment rooms. Substation No. 9 provides power for the electrical/lighting panels and for the fanhouse equipment in the Administration Building (101), and for the fanhouse equipment in the Engineering Building (102). The substation can no longer meet these requirements in its present configuration because of the substantial load increase since its original installation.

K. <u>Stennis Space Center (SSC)</u>	<u>\$2,390,000</u>
1. Rehabilitation of Air-conditioning System in Science and Technology Laboratory.....	510,000

This project provides for the installation of a new centralized air conditioning system in the Science and Technology Laboratory (1210). A new electronic control system will also be installed to connect the facility to the Center-wide Utility Control System to enable monitoring and remote operation of the building's utilities. This laboratory houses computers which analyze remote sensing data in support of the Space Shuttle Main Engine test program. Three separate expansions of the building have resulted in the installation of 20 small air conditioning systems. Many of these systems are now approaching the end of their life expectancy. Air handling units located above the computer room ceilings are difficult to service and are hazardous to the computers below. Installation of a centralized air system will result in more energy efficient environmental control and reduced maintenance cost.

2. Modifications to the Utility Control System, Various Locations.....	400,000
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This project furnishes the Utility Control System Central Station with additional logging and monitoring devices, communications network equipment, and other peripheral devices necessary to tie Buildings 1110 and 1201 into the Center-wide Utility Control System. The project also provides for the replacement of pneumatic controls and the refurbishment of the air handling units in the two buildings. These items are more than 20 years old and replacement parts are no longer available. This project will reduce operations and maintenance costs and improve the energy efficiency of the affected facilities.

3. Modifications to the Underground Communications Distribution System..... 580,000

This project provides for the replacement of a 6,200 linear foot underground communication duct bank which serves as the main trunk line from the Communications Building (1201) to "H" Road. Portions of the existing system are swelled shut from water penetration. The system is undersized to meet current and near term requirements. Replacement of this line will restore the system's reliability and reduce current operations and maintenance costs.

4. Modification of High Temperature Hot Water Generating System,
North Administrative Area..... 600,000

This project provides for the installation of natural gas-fired hot water generators in the North Administrative Complex, Buildings 1200, 1201, 3203, and 8100. Project includes the installation of gas supply piping, gauges, controls, water piping and ancillary equipment. This project will significantly reduce the operations and maintenance cost compared to the existing oversized and inefficient central heating distribution system.

L. Wallops Flight Facility (WFF)..... \$1,980,000

1. Rehabilitation of Fire Protection System
at National Scientific Balloon Facility (NSBF), Palestine, Texas..... 650,000

This project provides for the installation of fire protection systems in the 17 buildings at NSBF. The facilities affected are permanent structures housing personnel, material and equipment necessary for the NSBF mission. This project will provide compliance to local, state and federal fire codes and NASA Safety Regulations.

2. Rehabilitation of Main Staging Building 6 (NSBF), Palestine, Texas..... 430,000

This project provides for the renovation of the Main Staging Building at the National Scientific Balloon Facility (NSBF) in Palestine, Texas. The work includes: replacement of the heating, air conditioning and ventilating systems; installation of a new roof over the bay areas; flood lights in the bay areas; repair and sealing of exterior walls and bay doors; electrical and emergency power repairs; and exterior and interior painting. The Main Staging Building is the key structure at NSBF and must be fully maintained to meet the continuing and increasing needs of the NASA Balloon Program.

3. Modifications to Launch Complex One..... 900,000

This project provides for the modification of Launch Complex One through the complete renovation of Blockhouse No. 1 (Z-65), the addition of a launcher foundation and pad, the installation of a launch shelter, and modifications to utility and cable tray systems. The blockhouse will receive new mechanical and electrical systems; fire protection system; new roofing; modified interior layout and finishes; and the removal of two mechanical areas. The proposed modifications to Launch Complex One are required to support the installation of the new generation rocket launcher.

M. <u>Various Locations</u>	<u>\$1,790,000</u>
1. Rehabilitation and Modification of Infrared Telescope Facility, Mauna Kea, Hawaii.....	540,000

This project provides for the rehabilitation and modification of the Infrared Telescope Facility, Mauna Kea, Hawaii. Work consists of modification of interior partitions, installation of a stairway to the mezzanine to replace an existing ladder, construction of a small loading dock and a retaining wall. This project is necessary to accommodate the changes in astronomical instruments used, restore deteriorated building systems, and correct safety and foundation deficiencies identified during a facilities inspection.

2. Modification of Powerhouse, Madrid, Spain.....	900,000
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This project provides for: a) Modification or replacement of transformers, meters, cables, switchgear and breakers as required to allow operation of the existing diesel engine generators at their fully rated capacity for brief periods. This provides additional spinning reserve capability and operation at more efficient output levels; b) Addition of one 150 KW diesel engine generator dedicated to critical power; and c) Addition of one 750 KW diesel engine generator set. Growth of the Madrid Deep Space Communication Complex over the past decade has increased the complex electrical power requirements and necessitated improved utilization of existing generator capability. These changes will permit greater flexibility and efficiency in accomplishing maintenance and repair while continuing uninterrupted station power.

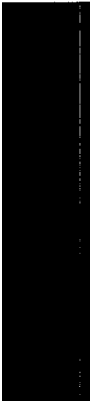
3. Modifications for Sewage Treatment, Madrid, Spain.....	350,000
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This project provides for a new waste water treatment facility at the Madrid Deep Space Communication Complex (MDSCC) located near Madrid, Spain. The existing catch basin will be closed and its associated leach field abandoned in place. Effluent piping will be routed to a new waste water treatment facility. The facility will include pumps, equipment housing and other required appurtenances. Upon discharge, the effluent will pass through multi-media filters producing irrigation quality effluent which will be accumulated in a lagoon downstream of the filters. The existing waste water treatment facility produces effluent of inadequate quality, which will require improvement to comply with applicable standards.

N. <u>Miscellaneous Projects Not in Excess of \$250,000</u>	<u>\$1,045,000</u>
Total	<u>\$34,800,000</u>

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$35,000,000 to \$40,000,000 per year will be required for continuing rehabilitation and modification needs.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

SUMMARY

MINOR CONSTRUCTION

Summary of Project Amounts by Location:

	<u>Amount</u>	<u>Page No.</u>
Ames Research Center	\$ 520,000	CF 13-2
Dryden Flight Research Facility	650,000	CF 13-2
Goddard Space Flight Center	730,000	CF 13-3
Jet Propulsion Laboratory	650,000	CF 13-3
Johnson Space Center	1,170,000	CF 13-4
Kennedy Space Center	1,545,000	CF 13-4
Langley Research Center	1,385,000	CF 13-5
Lewis Research Center	1,320,000	CF 13-6
Marshall Space Flight Center	1,450,000	CF 13-6
Michoud Assembly Facility	490,000	CF 13-7
Stennis Space Center	740,000	CF 13-7
Wallops Flight Facility	800,000	CF 13-8
Various Locations	1,145,000	CF 13-8
Miscellaneous Projects Not In Excess of \$250,000 Each	<u>305,000</u>	CF 13-9
Total	<u>\$12,900,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Minor Construction of New Facilities and Additions to Existing Facilities,
Not in Excess of \$750,000 Per Project

INSTALLATION: Various Locations

FY 1992 CoF Estimate: \$12,900,000

FY 1990: \$10,000,000

FY 1991: \$11,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for minor facility construction at NASA field installations and Government-owned industrial plants supporting NASA activities. Each project included in this program is estimated to cost not more than \$750,000 and involves either the construction of new facilities or additions to facilities. The FY 1992 request of \$12,900,000 will improve the usefulness of NASA's physical plant by changing the utilization of or augmenting the capabilities of various facilities. Included in this request are those programmatic and institutional projects that are essential to the accomplishment of mission objectives.

PROJECT JUSTIFICATION

The configuration of NASA's physical plant necessarily must respond to changes in utilization and adaptations required by changes in technology or in mission needs. Demands are generated by research, development, test, and similar activities. Specific justification for each minor construction project is provided under "PROJECT COST ESTIMATE."

PROJ TION

Included in the FY 1992 minor construction program are those facility projects for institutional or technical facility needs which could be fully identified at the time of submission of this budget estimate. Items of work totalling \$12,900,000 are included in this resource request and have been distilled from a list totalling over \$34,000,000. Projects were selected on the basis of the relative urgency of each item and the expected return on the investment. During the course of the year, the revision of priorities may require changes in some of the items to be accomplished. Such changes will be accommodated within the total resources allocated.

These projects represent requirements that must be met in this timeframe to support institutional needs and programmatic objectives. The following listing summarizes the cost distribution by category of work:

- a. General Purpose Buildings \$ 5,325,000
- b. Technical Buildings/Structures 7,575,000

PROJECT COST ESTIMATE:

- A. Ames Research Center (ARC) \$520,000
 - 1. Construction of Maintenance Operations Building 520,000

This project will provide for construction of a 9,600 gross square foot single-story all metal prefabricated building to house open shop space, maintenance operations, and support areas located adjacent to the maintenance yard. The project will provide space for maintenance support service contractor manpower growth. This growth has been caused by increased emphasis on maintenance of the infrastructure of ~~Ames~~ Research Center. A maintenance initiative has been developed to respond to infrastructure maintenance needs. The initiative provides funding increases for critically needed maintenance services. Existing facilities are not adequate to house additional personnel and equipment.

- B. Dryden Flight Research Facility (DFRF) \$650,000
 - 1. Construction of Child Care Center..... 650,000

This project provides for construction of a 6,000 gross square foot child care center with 5 age group areas, to accommodate 64 children. No on-site child care facilities are available for Dryden employees. The existing Edwards Air Force Base facility is full and has 300 children on the waiting list. Due to the remote

location of Dryden, off-site child care facilities are distant. Increased emphasis has been placed on employee child care facilities government-wide to improve employee retention, morale, and productivity. A facility is much needed at Dryden for these same reasons.

C. Goddard Space Flight Center (GSFC)..... \$730,000

1. Construct Addition to Building 7 for
Cryogenic Research and Integration..... 730,000

This project proposes the construction of a 5,000 square foot pre-engineered metal building addition to the northwest side of the Payload Testing Facility, Building 7, for the integration and testing of prototype and flight hardware containing cryogenic systems. Overhead doors and interior partitions, doors, and ceilings will be required in this addition. The construction will include: the surface finishes; heating, ventilating, and air conditioning systems; and proper air handling/filtering equipment for a class 100,000 cleanroom. In addition, a 25 ft. x 20 ft. seismic isolation area will be constructed as will electromagnetic and acoustic interference shielding. Provisions for handling nitrogen and helium cryogenics will be included as well as a 5-ton crane with minimum **35-foot** hook height. Existing facilities at GSFC cannot accommodate size, cleanliness, electromagnetic/radio frequency interference, and acoustic vibration requirements of advanced instruments and cryogenic systems.

D. Jet Propulsion Laboratory (JPL)..... \$650,000

1. Construction of Maintenance Storage Facility..... 650,000

This project proposes construction of a 4,000 square foot maintenance storage facility. The site is currently occupied by obsolete Buildings 116 and **187** which are used as open shelter storage. The present electrical storage is crowded into a converted garage space in the Maintenance Operations Building **283** and scattered throughout the Laboratory. Some electrical equipment must be stored outdoors due to lack of **storage** space. There is also a need to relocate the existing janitorial supplies from the Facilities Engineering and Service Building 200, releasing this space for engineering support use. The construction of this proposed facility will meet the present needs of the existing electrical maintenance storage and janitorial supplies storage, and will also provide JPL with needed warehouse space.

E. <u>Johnson Space Center</u> (JSC).....	<u>\$1,170,000</u>
1. Construction of Addition for Control/Actuator Systems Laboratory (351).....	720,000

This project provides for the construction of a 6,550-square foot control/actuator power systems laboratory adjacent to the Thermal Vacuum Test Facility, Building 351, in the Thermochemical Test Area. The project will include the installation of a transformer, special grounding, air-conditioning, sprinklers and fire alarm system, fluorescent lights, and electrical receptacles. This work is required to provide a facility capable of supporting test and evaluation of electrical mechanical actuators (EMA's) and power generation/distribution equipment which are needed to assure continued Space Shuttle availability in future years. No existing facility is currently available to meet the requirements of this hazardous testing.

2. Construct Employment and Industry Assistance Center (111).....	450,000
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This project provides for construction of a one-story building on the east side of the Security Control Center, Building 110. The building will be approximately 3,400 square feet and will be connected to Building 110 by an enclosed passageway. This facility located outside the JSC secure area will provide space for; an employment office, an industry assistance office and procurement space. The greater accessibility of this building will make bid opening procedures more convenient and reduce security risks. Additionally, it will allow space in building 45 to be used for other more critical secure functions.

F. <u>Kennedy Space Center</u> (KSC).....	<u>\$1,545,000</u>
1. Construct Covered Storage for Solid Rocket Motor (SRM) Transporter #2.....	315,000

This project provides for construction of a 3,000 square foot covered pre-engineered metal building for storage of SRM Transporter No. 2. The building will be equipped with fire protection, power and fire detection. Building K6-743 has indoor storage for only one SRM Transporter. The SPC contractor has O&M responsibility for two SRM transporters. Covered storage is necessary to eliminate electrical problems associated with water entry into electrical panels and to reduce deterioration of components exposed to the **harsh** coastal environment.

2. Construct KSC Gateway Facility Expansion.....	300,000
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This project provides for the construction of an 1800 square foot addition to the Gateway Facility Program Support Communications Network (PSCN) to support growing communications requirements at KSC. **Work** includes expansion of an existing pre-engineered metal building using similar construction, addition of HVAC, power, lighting, and fire protection/detection.

3. Construct Film Storage Facility..... 470,000

This project provides for the construction of a **4,000** square foot film storage facility. The facility will provide temperature and humidity control for the proper environment to preserve film which is presently stored in the KSC Headquarters building. Temperature and humidity control in this building cannot be maintained to required specifications because the facility HVAC system is designed only for personnel comfort. The lack of environmental control is causing the deterioration of the stored film, some of which are one-of-a-kind historical records. Due to a requirement to store all launch support film, existing storage space is rapidly being filled.

4. Construct Fuel Storage Area 1 Operations Control Building..... 460,000

This project provides for the construction of a new 3,800 square foot building in the fuel storage area at the Cape Canaveral Air Force Station. The building will be a concrete block structure added to existing building **1047**. The building will provide remote monitoring capability of hazardous operations and will house approximately 20 personnel. The new facility will result in a safer, more productive, remotely monitored operation in the fuel storage area. Operations include storage of hazardous fuels, hypergol incineration, treatment of chemical wastes and stockpile of hypergols. The areas where these functions presently occur are old and overcrowded. With more anticipated activity, the possibility of an accident or fire will be greater without the new facility.

G. Langley Research Center (LaRC) **\$1,385,000**

1. Construction of University Affairs Complex (**1216**)..... 695,000

This project provides for the construction of an academic facility of approximately **4,800** square feet and consisting of: a computer room; a conference room; offices for administrative staff, faculty, and research associates; a student room; rest rooms; and circulation and environmental spaces. The building will be constructed to accommodate a future second floor. The project also includes site improvements, landscaping, parking and all utilities necessary to provide a functional facility. This project consolidates Langley's university programs which are currently fragmented throughout the Center.

2. Construction of Annex for Photo Lab (**1145**)..... 690,000

This project provides for the construction of an annex to Langley's Photo Lab of approximately **3,500** square feet. This annex will provide the photo lab with a still photography studio. Construction will be reinforced concrete slab on grade, structural framing, masonry exterior walls, insulated built-up roof, **HVAC**,

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plumbing, electrical, and lighting systems. This project also includes necessary site improvements, utilities, parking, and landscaping. This project will alleviate existing crowded and confined conditions and provide controlled small areas for classified photographic work.

H. Lewis Research Center (LeRC)..... **81,320,000**

1. Construction of Engineering Support Center, Power Systems Facility..... **600,000**

This project provides for the construction of a **3,300** gross square foot addition to the Power Systems Facility (PSF). LeRC has been assigned the total programmatic responsibility for the Space Station Electrical Power System, Space Station Program work package four. This responsibility includes design, construction, prelaunch checkout, launch, and on-orbit operation. The Engineering Support Center will provide on-call or scheduled engineering support during prelaunch, launch, on-orbit assembly, and operation of the Space Station Electrical Power System.

2. Addition and Modifications for Space Storage Propulsion Building (35-4) **720,000**

This project will modify and provide an addition to the existing Combustion Research Laboratories (CRL) propellant storage facility to store liquid oxygen, methane, and ethanol. The work includes the supply and installation of: LOX, methane and ethanol propellant management systems; test tank; ejector system; new control room; and new laser equipment room. The existing space storable facility is limited to gaseous hydrogen and oxygen (GH/GO) propellants. This project will provide an additional facility for liquid cryogenic space storables (LOX + methane) plus ethanol.

I. Marshall Space Flight Center..... **\$1,450,000**

1. Construct Sandblast Facility..... **470,000**

This project provides a **3,400** square foot building to be used as a sandblasting and glassbead blasting facility in direct support of the Solid Rocket Booster (SRB) refurbishment operation at Kennedy Space Center. Scope includes two high bay drive-in blasting areas with isolating doors and environmentally protected door drives, associated operations support areas, and a small administrative area. The volume of sandblasting and glassbead blasting currently required in support of the SRB refurbishment process is three times greater than the capability of the existing facility.

2. Construct Addition for Laboratory Space..... 490,000

This project provides a 3,300 square foot addition to Building 4623 to house a cone calorimeter lab, a wire flashover lab, a smoke density test cell, a propellant oxidation compatibility lab, and an administrative area. These cells are required to accomplish additional testing of all NASA space hardware systems to ensure their safe performance in environments that support combustion. This testing capability permits proper materials selection for the Space Shuttle Program, Spacelab Payloads, Space Station Freedom, and the various advanced propulsion systems currently under research or development.

3. Construct Addition to Communications Building..... 490,000

This project provides a 3,000 square foot addition to the Communications Building (4207) to support audio/video production services. Project scope includes rooms for recording, playback, transmission, equipment maintenance, storage, and about 1,500 square feet of raised floor. The existing audio/video area is outgrown and overcrowded. This expansion is essential to satisfying the increased production workload generated by the on-going NASA missions and to maintaining the quality and efficiency of the audio/video services being provided out of this facility.

J. Michoud Assembly Facility..... \$490,000

1. Construct Fabrication Shop..... 490,000

This project provides a 6,000square foot high bay enclosure for facilities-related fabrication operations such as welding, cutting, burning, sawing, drilling, and shearing metal. Scope includes a pre-engineered building on a concrete foundation, a ventilation system, supporting utilities, and a fire detection system. The activities to be housed in this facility are currently split in three separate buildings. This present configuration is very inefficient and potentially unsafe because the areas being used provide inadequate space and difficult access.

K. Stennis Space Center..... \$740,000

1. Addition to Communications Building..... 740,000

This project provides a 7,000 square foot addition to the Communications Building (1201). Scope includes precast concrete exterior walls on concrete slab, and all necessary electrical, HVAC, plumbing, fire alarms, sprinkler systems, and access controls. The communications support function at this center is undergoing a substantial expansion in support of the Space Shuttle Main Engine test program. The functional requirements of this expansion exceed the physical capabilities of the existing facility and it is not practical to split up or relocate this activity to another location.

L. Wallops Flight Facility (WFF)..... \$800,000

1. Construction of Test and Evaluation Facility
at the National Scientific Balloon Facility (NSBF), Palestine, Texas..... 500,000

The project provides for the construction of a 30' x 30' x 32' high bay addition and a 60' x 23' single story addition to the existing pre-engineered metal Launch Support Building 8, to provide a Test and Evaluation Facility at NSBF. The existing structure will be stripped of its roofing and siding, and new insulated sandwich panels will be applied to the entire structure. The high bay will be equipped with a 5-ton monorail hoist. *The* work includes partial building demolition; concrete foundation and slab; steel building structure; metal doors and windows; motorized overhead coiling doors; roof and wall panels; interior finishes; electrical power; lighting; plumbing; compressed air system; HVAC. paving and site work. This facility is required to provide T&E capability for Long Duration Support Instrumentation Packages, thermal-vacuum testing of flight components, and thermal-vacuum testing of complete science gondolas.

2. Construct Main Base Security/Visitors Control Building..... 300,000

This project calls for the construction of a 2,100 square foot facility. The work includes the foundation, concrete slab, pre-engineered building, installation of doors and thermal windows, interior finishes, reception counter, toilet facilities, HVAC, electrical, emergency power, lighting, and fire alarm system. The Visitor Control Building currently houses the administrative and operational functions of the security force which supports the overall mission of the GSFC/WFF. The existing facility built in 1955 is 345 square feet, is crowded and does not provide sufficient space for processing up to 30 visitors per day, for badging, fingerprinting and interviewing personnel involved in incidents.

M. Various Locations..... \$1,145,000

1. Construction of Operations Building Addition, Canberra, Australia..... 220,000

This project provides for construction of a 3,200 square foot addition to the main operations building at the Canberra Deep Space Communications Complex (CDSCC). Inadequate office and work areas combined with the storage of some equipment and files in hallways contributes to inefficient and hazardous conditions. This building extension will provide additional office accommodations, a test equipment storage room, and an engineering research and development area.

2. Construction of Antenna Component Maintenance Building, Goldstone, California..... 525,000

This project provides for the construction of a 3,300 square foot metal building at the Mars site for housing antenna maintenance personnel with appropriate supporting work and storage space. The building will have fire detection and suppression systems and a complete HVAC system. This project provides space at the **MARS** site to consolidate all antenna electronic and mechanical repair activities for the Goldstone complex.

3. Construct Support Equipment Maintenance Building, Bermuda..... 400,000

This project provides for construction of a 4,800 square foot maintenance building to house and service special purpose vehicles and equipment used in support of the 9-meter antenna systems at the Spaceflight Tracking and Data Network station in Bermuda. Utilities include compressed air, water, and electrical power. Hot water heating will be provided utilizing waste heat from the station's power plant. The building will be constructed of limestone block consistent with local architecture. The Bermuda tracking station supports the Space Shuttle and other spacecraft. Special purpose vehicles and equipment are currently stored in the open, where they are exposed to the severely corrosive salt air environment, and severe storms, including hurricanes.

N. Miscellaneous Projects Not In Excess of \$250,000 Each..... \$305,000

Total..... **\$12,900,000**

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$13,000,000 to **\$15,000,000** per year will be required for continuing minor construction needs.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

SUMMARY

FACILITY PLANNING AND DESIGN

	<u>Amount</u>	<u>Page No.</u>
<u>Regular Requirements:</u>	<u>\$17,650,000</u>	
Master Planning.....	600,000	CF 14-2
Sustaining Engineering Support.....	1,150,000	CF 14-2
Preliminary Engineering Reports and Related Special Engineering Support.....	3,700,000	CF 14-4
Final Design.....	12,200,000	CF 14-5
<u>Other Requirements.....</u>	<u>\$16,350,000</u>	
Space Flight Facility Planning and Design.....	5,200,000	CF 14-5
Aeronautical Facility Revitalization.....	2,400,000	CF 14-5
Space Station Freedom Facility Planning and Design.....	5,750,000	CF 14-6
Workforce Housing Facility Planning and Design.....	3,000,000	CF 14-6
Total.....	<u>\$34,000,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Facility Planning and Design

FY 1992 CoF Estimates: **\$34,000,000**

FY 1990: \$26,300,000

FY 1991: **\$28,000,000**

The funds requested in this estimate are required to provide for the following advance planning and design activities related to facilities activities and projects:

a. The accomplishment of necessary development and master planning for field installations and, where not otherwise provided for, the provision of continuing engineering support and special engineering management and other services.

b. The preparation of preliminary engineering reports, cost estimates, and design and construction schedules.

c. The preparation of final construction plans, specifications, and associated cost estimates and schedules required to implement construction projects.

d. The accomplishment of facilities siting and other investigations, studies and reports, where not otherwise provided for.

Regular requirements encompass the basic purposes outlined above. The "other requirements," while also in support of "regular" purposes, cover those special needs related to large, complex projects or specific programs considered to represent high potential future construction requirements for which early definition is essential. The large projects require more planning and longer lead time. Much of this planning must be completed prior to inclusion of the project in a budget request.

1. <u>REGULAR REQUIREMENTS</u>	<u>\$17,650,000</u>
A. <u>Master Planning</u>	<u>600,000</u>

Provides for update and development of existing field installation master plans. This effort includes facility studies, site investigations, and analyses of utility systems. The master plan documents will be updated to reflect as-built conditions and to graphically represent the 5-year facility plan baseline for future development.

The NASA field center master plans are periodically updated. On an agencywide basis, the level of effort remains fairly constant. The master plans are essential as reference documents for land use planning, identification of physical relationships of facilities, and proper orientation and arrangement of facilities. Representative candidates for FY 1992 master planning are as follows:

(1) Lewis Research Center

An update to reflect as-built condition of facilities and utilities with emphasis on changes caused by recent facility planning, construction, and modifications.

(2) Johnson Space Center

An update of the facilities inventory base to reflect new construction, utility system changes and related to 5-year planning especially associated with Space Station Freedom requirements.

B. <u>Sustaining Engineering Support</u>	<u>1,150,000</u>
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Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years, and must be given high priority throughout FY 1992. These efforts are important due to changing cost trends in construction materials and fuels; the continuing importance of energy conservation and efficiency; and the operation and maintenance costs for the physical plant.

The following items are included in the FY 1992 requirements:

(1) Building Research Board

Covers annual support to the Federal Construction Council's (FCC) operations and provides for special studies that the Council will perform throughout FY 1992 to help advance the science and technology of Federal Government building and construction. The FCC is subordinate to the Building Research Board, National Academy of Sciences, and its activities are supported by NASA and several other Federal agencies.

(2) Utilities Services/Rates Analysis

Provides resources, when needed, for the support of utilities procurement and utilities control systems. This support includes, but is not limited to, technical assistance, surveillance, and recommendations with regard to utility rates, contract negotiations, and systems operations, including control systems to manage utilities usage efficiently.

(3) Facility Operation and Maintenance Analysis

Provides for continued engineering support for implementing improvements at NASA field installations relative to manpower utilization, work control systems, preventive maintenance, facilities management and reporting systems. Improvements will also involve techniques to identify where and how increases in productivity are possible. Included in this activity are field surveys to be conducted on a priority **basis** at selected **NASA** field installations to evaluate the effectiveness and efficiency of the operations and maintenance management systems.

(4) Value Engineering Cost Validations and Analyses

Provides for engineering services to improve cost-effectiveness of facility projects by subjecting project design criteria, specifications and working drawings for specific material components and systems to a detailed independent review by engineering specialists in the particular area of involvement. Also provides services necessary to predict accurately and validate facility costs which will aid in resources planning for the various field installations.

(5) Facilities Utilization Analyses

Provides for the analyses of agencywide facilities utilization data covering (1) office and other types of building space; (2) designated major technical facilities; and (3) special studies comparing the utilization of technical facilities which are similar in type or capability, such as wind tunnels. Such analyses provide for (1) insights into and development of better methods of identifying underutilized facilities; (2) improved techniques to quantify level of facilities use; and (3) actions to improve facilities utilization. Work provides for review of each installation's inventory data base in support of the facilities utilization program. Surveys are necessary to validate the reported data in relation to a specific problem or need, and to assist in providing a credible foundation for plans to improve the utilization of facilities.

(6) Facility Project Implementation Handbook

Provides for continued engineering support to revise and publish the Facility Project Implementation Handbook which was first published in 1981 and requires updating to reflect changes in legislation, organization, procedures techniques, and the state of the art. This Handbook provides the policy and guidance for management of all phases of NASA facility projects from concept through activation.

(7) Facilities Management Systems

Provides for continued engineering support for the technical updating of NASA's master text construction specifications to reflect the use of new materials, state-of-the-art construction techniques and current references to building codes and safety standards.

Also included is the on-going effort for the improvement and modernization of NASA's construction project status reporting and data systems as well as automating NASA's project management system and document preparation capabilities.

(8) Independent Analysis and Third Party Reviews

Provides the technical and engineering support analyses, designs, and reviews required to verify, confirm and ensure suitability of construction designs and cost estimates for complex projects.

C. Preliminary Engineering Reports and Related Special Engineering Support..... **3,700,000**

(1) Preliminary Engineering Reports (PER's)..... **(3,200,000)**

This estimate provides for preparation of PER's, investigations, and project studies related to proposed facility projects in the FY 1994 and FY 1995 Construction of Facilities programs. These reports are required to permit the early and timely development of the most suitable project to meet the stated programmatic and functional needs. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals. This request provides for PER's associated with proposed construction, except as provided for in other requirements (paragraph 2) for Space Flight, Space Station Freedom, Aeronautical Facilities Revitalization, and Workforce Housing projects.

The estimated cost of PER support for FY 1994 construction projects is **\$2,700,000** which will permit updating of PER's for **\$50-70** million in construction, and the development of new PER's for an additional \$100-120 million in projects.

An additional **\$500,000** has been included in this line for the completion of new PER's for approximately **\$20-30** million of construction projects which will be high priority candidates for inclusion in the FY 1995 Construction of Facilities program. The activity associated with FY 1995 will be confined to the highest priority candidates.

(2) Related Special Engineering Support..... **(500,000)**

This estimate provides for investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs. Such studies involve documentation and validation of "as-built" conditions, survey/study of present condition of such items as roofing and cooling towers, utility plant condition and operational modes, and other like studies. These

studies are required to allow for the timely development of projects to meet the stated functional needs and to provide basic data, cost estimates and schedules for related future budgetary proposals.

D. Final Desi..... 12,200,000

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of projects other than Space Flight, the Space Station Freedom, Aeronautical Facilities Revitalization, and Workforce Housing projects. Amounts required for those efforts are included under other requirements. Projects involved are planned for inclusion in the FY 1993 and FY 1994 programs. The goal is to obtain better facilities on line earlier at a lower cost.

The request will provide for final design work associated with construction proposed for the FY 1993 Program, estimated to cost \$130 to \$150 million, and for \$20 to \$30 million of high potential projects proposed for the FY 1994 program. The amount included for FY 1993 candidates and for residual requirements of this nature which have accumulated from prior years' final design activities is \$10,400,000. For FY 1994, \$1,800,000 is included and design activity will be confined to the highest priority candidates.

2. OTHER REQUIREMENTS..... \$16,350,000

Included in this particular request are other facilities planning and design requirements primarily associated with specific programs characterized by large size, long planning cycles, and/or complexity of scope. These programs require a multi-year planning effort. These requirements must be provided beyond the regular and most recurrent facility planning and design needs.

A. Space Flight Facility Planning and Design..... (5,200,000)

These resources provide for early and progressive design, final drawings, specifications, and site investigations for Space Flight facilities in order to ensure the best design, good cost estimates and realistic construction schedules. The Shuttle operational era requirements include: improvement of Shuttle processing facilities, repair and maintenance facilities to support the launch rate, construction of operations personnel facilities, modification to the launch complex support facilities, and modifications at various locations for space engine enhancement and testing.

B Aeronautical Facilities Revitalization Facility Planning and Design..... (2,400,000)

The amount requested will provide for preparation of final designs and specifications required for continuation of the Aeronautical Facilities Revitalization Program initiated in FY 1989. This is a structured multi-year effort to restore and modernize NASA's aging aeronautical research and development facilities at various NASA installations.

C. Space Station Freedom Facility Planning and Design..... (5,750,000)

This requirement is a continuing effort primarily for preparation of preliminary engineering reports and final design drawings, specifications and associated site investigations required for construction of Space Station facilities at various locations. Included are automation and robotics sciences research, space sciences research, solar dynamics simulation, crew training, processing and prelaunch checkout facilities.

D. Workforce Housing Planning and Design..... (3,000,000)

This requirement provides for the study, planning and design of high priority workforce housing projects that are the direct result of increasing on-site personnel space requirements. High off-site lease costs and inadequate and substandard on-site housing have generated a critical need for remedial action to counter and reverse the serious condition of NASA's present workforce housing capacity.

Total..... \$34,000,000

ENVIRONMENTAL
COMPLIANCE AND
RESTORATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES
SUMMARY

ENVIRONMENTAL COMPLIANCE AND RESTORATION

<u>Summary of Project Amounts by Activity:</u>	<u>Amount</u>	<u>Page No.</u>
<u>CLEANUP</u>	<u>\$13,670,000</u>	
Resource Conservation and Recovery Act (RCRA).....	5,460,000	
Corrective Action.....	5,460,000	CF 15-3
Closures Greater Than \$10M.....	---	
Comprehensive Environmental Response. Compensation. and Liability Act (CERCLA).....	8,210,000	
NPL Sites.....	2,160,000	CF 15-4
Non-NPL Sites.....	6,050,000	CF 15-5
<u>COMPLIANCE</u>	<u>\$22,330,000</u>	
Resource Conservation and Recovery Act (RCRA).....	13,770,000	
Site Studies.....	1,000,000	CF 15-7
Closures Less Than or Equal to 810M.....	4,120,000	CF 15-7
Leaking Underground Storage Tanks (LUST).....	7,650,000	CF 15-8
Storage Facilities.....	1,000,000	CF 15-10
Comprehensive Environmental Response. Compensation. and Liability Act (CERCLA).....	3,600,000	CF 15-11
Clean Air Act (CAA) - Air Pollution Controls.....	750,000	CF 15-11
Clean Water Act (CWA) - Water Pollution Controls.....	4,010,000	CF 15-12
Toxic Substance Control Act (TOSCA).....	<u>200,000</u>	CF 15-13
Total.....	<u>\$36,000,000</u>	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1992 ESTIMATES

FAL COMPLIANCE AND RESTORATION

<u>Summary by Location:</u>	<u>Amount</u>
Ames Research Center.....	\$ 3,120,000
Goddard Space Flight Center.....	400,000
Jet Propulsion Laboratory.....	3,130,000
Johnson Space Center.....	910,000
Kennedy Space Center.....	2,620,000
Langley Research Center.....	4,500,000
Lewis Research Center.....	2,680,000
Marshall Space Flight Center.....	3,895,000
Michoud Assembly Facility.....	2,000,000
Stennis Space Center.....	550,000
Wallops Flight Facility.....	1,800,000
White Sands Test Facility.....	2,000,000
Miscellaneous Projects Not in Excess of \$250,000 Each.....	1,660,000
Remedial Investigations. Feasibility Studies. Assessments. Design and Related Engineering.....	<u>6,735,000</u>
Total.....	<u>\$36,000,000</u>

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1992 ESTIMATES

PROJECT TITLE: Environmental Compliance and Restoration Program

INSTALLATION: Various Locations

FY 1992 CoF Estimate: \$36,000,000

FY 1990: **\$30,000,000**

FY 1991: **\$32,000,000**

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY P AND SCOPE:

These resources will provide for studies, assessments, remedial investigations, feasibility studies, related engineering, design and remedial projects for environmental compliance and restoration measures at NASA field installations, Government-owned industrial plants supporting NASA activities and other locations where NASA operations have contributed to environmental problems and is obligated to contribute to cleanup costs. In addition, these resources will be used to acquire land if needed to implement these environmental compliance and restoration measures. The purpose of this program is to enable compliance with mandatory statutory environmental requirements and standards. The resources authorized and appropriated pursuant to this program may not be applied to other activities. The program includes such measures as studies or assessments to determine current status and options for remedial action, prescribed remedial investigations (RI) and feasibility studies (FS) as required by Federal environmental laws, environmental restoration, hazardous waste removal and disposal, cleanup and closures and removal of unsafe buildings and debris.

PROJECT JUSTIFICATION

This environmental compliance and restoration project and activities for fiscal Year 1992 total approximately \$36,000,000. This program represents only a request in relation to the total for this compliance and that must be the next several years. The on relative growth of the listed projects and their requirements and are currently planned for accomplishment in FY 1992. Deferral of these necessary remedial measures would preclude NASA from complying with

environmental requirements and jeopardize critical NASA operations. Remedial investigations, feasibility studies, assessments, design and related engineering costs are estimated to be approximately \$6,735,000. Projects estimated to cost less than \$250,000 have not been described or identified by specific location. The estimated cost of these projects is \$1,660,000. As studies, assessments, remedial investigations, feasibility studies, and designs progress and as new discoveries or regulatory requirements change, it is expected that priorities may change and revisions of the activities and projects may be necessary.

PROJECT COST ESTIMATE

<u>CLEANUP</u>	<u>\$13,670,000</u>
Resource Conservation and Recovery Act (RCRA).....	<u>5,460,000</u>

The following projects and related engineering activities provide for corrective cleanup actions taken pursuant to requirements of the Resource Conservation and Recovery Act (RCRA) or under a comparable State, interstate, or local law, compact, or regulation.

Corrective Action:

1. Remediation of Contaminated Soil, Edwards Test Station (ETS),
Jet Propulsion Laboratory..... **550,000**

This project will provide for the remediation of contaminated soils at the Edwards test facility. The full scope of the project will be identified subsequent to submittal of the RCRA Part B permit application for the waste propellant burn pit. As mandated by RCRA, EPA will require a full assessment of all solid waste management units at ETS, and remediation of all sites found to contain contamination.

2. Install Abatement Wells for Groundwater Remediation, Michoud Assembly Facility..... 2,000,000

This project provides for installation of abatement wells and monitoring wells in the Solid Waste Management Units (SWMUs) areas as identified in the RCRA Facility Investigation Study. The scope includes installation of fifteen abatement and fifteen monitoring wells at 20'-100' depth and associated equipment including piping/valving and holding tanks in these areas: 1) Hazardous Materials Storage Building 221, 2) abandoned landfills and the Borrow Canal, and 3) General Manufacturing Area. The work also includes the installation of a treatment facility to support remote abatement wells and a soil incinerator. MAF RCRA Permit for operating MAF as a treatment/storage/disposal facility for hazardous waste was issued on December 10, 1987 with special conditions and RCRA Section 3004 (U) and Federal regulations (40 CFR 264.101). The conditions require the following actions: 1) RCRA Facility Investigation (RFI) addressing releases from SWMUs to the soil, groundwater, surface water, and air and 2) Corrective action for releases of hazardous waste/constituents from any SWMU. A special study, currently in progress, will determine the type

and extent of the contamination in the SWMUs EPA will determine if remediation is required based on the results of the study.

3. Groundwater Contamination Assessment and Remediation, White Sands Test Facility 2,000,000

This is a continuing effort to define the extent, impacts, and possible remedial approaches for groundwater and soil contamination existing at WSIF and affected offsite areas. This phase of the project includes continued definition and analysis of offsite contamination and public health risks resulting from areas 200, 300, 400 and 600 and from onsite solid waste management units. the majority of the work consists of installation of monitoring wells as required to define the horizontal and vertical contamination characteristics of the groundwater and related soil borings, data analyses, computer models, and engineering/chemical analysis. This will also provide interim measures which will be incorporated as part of the remedial action. The work is required under RCRA and is a major constituent of an EPA consent order.

Miscellaneous Projects Not in Excess of \$250,000 250,000

Studies, Assessments, Design and Related Engineering 660,000

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 8,210,000

National Priorities List (NPL) 2,160,000

The following projects and related engineering activities provide for cleanup actions required pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended for sites that are listed on the National Priorities List (NPL), are proposed for listing, or there is reason to believe they may be listed.

1. Remediation of Ruptured Artesian Well, Ames Research Center 560,000

This project seals the aquitard between the upper level groundwater and lower aquifers at the site of the rupture of an underground 3000 psig air tank. Rupture of an underground high pressure tank has caused artesian flow from aquifers approximately 600 ft. deep. This provides a path for contaminated ground water to pollute the deeper drinking water aquifers. The path must be sealed with impervious material to maintain aquifer separation. This project is required by the Santa Clara Valley Water District and the California Regional Water Quality Control Board, San Francisco Bay Region.

2. Remediation of Contaminated Soil at Aircraft Ramp Area, Ames Research Center 1,100,000

This project provides for the removal of contamination (primarily aircraft fuel) from the site of former underground fuel tanks at Building N-248. It includes installation of in-situ hydrocarbon removal wells, equipment, and monitoring stations. This project is covered by a Record of Decision with the EPA, the

California Regional Water Quality Control Board, the Santa Clara Valley Water District, and the California Department of Health Services.

3. Remediation of Groundwater Contamination,
Middlefield-Ellis-Whisman (MEW) Superfund Site, Ames Research Center (ARC) 500,000

This project provides NASA's contribution to the remediation of groundwater contamination from the MEW Superfund site. It provides a portion of the funds needed to install wells and a water treatment plant at ARC to remove chlorinated solvents and hydrocarbon contamination in a plume currently reaching under the ARC site. Water discharge from the treatment plant will be available for use as makeup water for ARC wind tunnels, for landscaping, and for related uses. This project is covered by a Record of Decision with the EPA, the California Regional Water Quality Control Board, the Santa Clara Valley Water District, and the California Department of Health Services as part of the cleanup of the Middlefield-Ellis-Whisman (MEW) Superfund site.

Non-NPL Sites..... 6,050,000

The following projects and related engineering provide required cleanup for sites that are not listed on the NPL and still likely to be addressed under CERCLA cleanup authorities rather than another authority.

1. Remediation of Contaminated Soil and Groundwater at
the National Fullscale Aerodynamic Complex (NFAC), Ames Research Center..... 600,000

This project provides for the remediation of contaminated groundwater and soil in the vicinity of the NFAC Facility. Fuels and solvents used in the operation of this facility have contaminated the local soil and groundwater. Leaking underground storage tanks and past handling practices are the causes of the contamination at several sites around the NFAC facility. Since the shallow zone in which the contamination is contained has drinking water as one of its designated beneficial uses, the government is required to remediate the site.

2. Cleanup of Arroyo Seco Groundwater Contamination,
Jet Propulsion Laboratory (JPL)..... 1,000,000

This project provides for continued remediation of groundwater in the Arroyo Seco aquifer. Sampling and testing of groundwater in the vicinity of JPL have confirmed the presence of trichloroethylene, carbon tetrachloride, and tetrachloroethylene in excess of Federal and State of California standards. Ongoing studies are continuing to confirm the extent of the contamination. This site may be added to the "National Priorities List."

3. Remediation of PCB and Mercury at Warehouse Area E, Langley Research Center (LaRC)..... 500,000

This project will provide for remediation of soil contamination in the Warehouse Complex, Area E.

Excavation and backfill of some areas is required. Ground and surface water monitoring will be necessary. Caution must be taken to assure no water contamination results. All excavated material will be disposed of in accordance with EPA regulations. A site inspection, completed in May 1989, recommended a survey to identify and determine the extent of mercury, lead, and PCB contamination in surface and subsurface soils. A preliminary EPA Hazard Ranking Index score for this and two other sites may result in placing LaRC on the National Priorities List. A remediation plan is needed to satisfy National Contingency Plan requirements.

4. Remediation of PCB/PCT at TabbsCreek, Langley Research Center..... 2,000,000

This project is to provide for the remediation of Tabbs Creek which was contaminated with Polychlorinated Biphenyls (PCBs) and a related chemical, Polychlorinated Terphenyls (PCTs) released from the Langley storm drain system. PCBs are regulated by the Toxic Substance Control Act. Clean up is regulated under the Comprehensive Environmental Response and Liability Act (CERCLA). Tabbs Creek is located behind the Center and joins the Northwest Branch of Back River about a mile from the center property line. Tabbs Creek is a tidal wetland and Back River is used for oyster harvesting. PCT contamination has been found in oyster tissue near the mouth of Tabbs Creek. Contamination poses a health threat to the oyster population of Back River. The Center was cited in January 1990 with a Notice of Violation from the State Water Control Board for the unpermitted discharge of both PCBs and PCTs into Tabbs Creek and Back River, and for the contamination of shell fish in the area. The Center has also been cited by the EPA as a noncomplying Federal Agency within the Chesapeake Bay watershed. Remediation is required to mitigate oyster contamination and possible fish contamination. Back River is also used for recreational boating and swimming. Remediation is required to prevent spread of contaminants by tidal action to the Back River.

5. Remediation of South 40 Landfill, Lewis Research Center (LeRC) 400,000

This project will begin the environmental remediation of the South 40 landfill area at LeRC. The South 40 landfill site is located in the southeastern most area of LeRC. It occupies approximately six acres and was used for landfilling from 1941 to the late 1970's. The quantities and types of wastes disposed of at the site are largely undocumented, but several drums and other materials have been pulled from the landfill slopes leading to the nearby Abram Creek. The project will involve offsite disposal of waste materials and stabilization of the site.

6. Remediation of Drillers MUD Site, Marshall Space Flight Center (MSFC)..... 1,000,000

This project consists of the excavation of contaminated material from an abandoned lagoon on MSFC property. The material is contaminated with barium, chromates, and organics. Approximately 1,000 cubic yards of wastes and 500 cubic yards of contaminated soil will require excavation and then transported and disposed of at an approved disposal facility. The excavated area will then be filled and capped with impervious material. This disposal site represents a potential groundwater contamination threat. Removal of this material and filling and capping of the disposal site area will eliminate the potential for groundwater contamination. These actions are required by CERCLA and RCRA regulations.

Miscellaneous Projects Not in Excess of \$250,000 Each.....	550,000
<u>COMPLIANCE</u>	<u>\$22,330,000</u>
Resource Conservation and Recovery Act (RCRA)	<u>13,770,000</u>
Site Studies... ..	1,000,000
Provides for facility assessments, investigations, corrective action design.	
Closures Less Than or Equal to \$10M	4,120,000

The following projects provide for closures to comply with closure **or** post-closure requirements under the Solid Waste Disposal Act (SWDA) **or** comparable State, interstate, or local law, if the closure will cost less than **or** equal to \$5 million for one unit or \$10 million for multiple units.

1. Close Ransom Road Landfill, Kennedy Space Center..... **300,000**

This project will clean, fill, regrade, and construct a multi-layer cap over 10 acres of the existing Ransom Road landfill. The landfill cap will consist of five layers including an earthen base cap, a cover/buffer cap, an impermeable synthetic membrane (polyvinyl chloride, **30** mils thick), and two additional earthen layers. A gas collection system will be incorporated into the cap, and the cap surface will **be** stabilized by seed and mulch. This will complete remedial action for the closure of the landfill in accordance with the approved State of Florida Department of Environmental Regulations closure plan.

2. Close Schwartz Road Landfill, Kennedy Space Center..... 2,000,000

This project will clear, regrade, and construct a multilayer cap over the existing **52** acre Schwartz Road landfill. An impermeable cap with a gas collection system and surface water runoff collection system will be constructed. The Schwartz Road landfill will reach its disposal capacity by late 1991. Groundwater monitoring wells have detected levels of organic and inorganic contaminants above the Florida Department of Environmental Regulations Standards for groundwater. These exceedances threaten to contaminate area ground waters which are within a high quality aquifer recharge area. An impermeable landfill cap is required to reduce the formation of landfill leachate, to inhibit the offsite migration of landfill contaminants, and to comply with Florida regulatory standards for controlling sources of ground water contamination.

3. Closure and Remediation of Surface Impoundments,
Santa Susana Field Laboratory (SSFL), California..... **800,000**

This project provides for compliance with City, County, State, and Federal laws for the remediation of

soil and ground water to acceptable levels. The work includes ground water analysis as well as considerations of the vadose zone (unsaturated). These activities include an engineering analysis that addresses an SSFL and Environmental Protection Agency (EPA) negotiated level of work. In order to delineate and quantify the contamination over an area of 450 acres, the project involves soil borings, ground water monitoring well installations, and chemical analyses associated with these efforts. The project will contribute to the completion of a RCRA facility investigation based upon the efforts of previous years and initial implementation of an acceptable corrective action. This includes monitoring ground water quality and flow; ground water treatment; remediation of solid waste. SSFL is required to document the extent of the contamination to the environment caused by operations over the past 40 years. Preliminary soil surveys and monitoring wells installed to date have indicated widespread trichloroethylene contamination throughout SSFL. Under Section 3008(h) of the RCRA, SSFL and the EPA are in the process of negotiating an agreement which will outline mandated actions and schedules for the contamination assessment and evaluation of alternative remedial measures.

4. Closure of ALPHA/BRAVO Fuel Farm,
Santa Susana Field Laboratory (SSFL), California..... 370,000

Leaks of RP-1 and JP-1 at the ALPHA/BRAVO Fuel Farm and associated abandoned lines caused the soil to be contaminated with engine fuel. The fuel farm has no spill containment, only a dirt bottom under the tanks. The fuel line has been abandoned but still contains fuel that leaks into the soil. The contaminated soil will be removed as well as abandoned lines and sealed spill containment will be provided under the tanks. The project was identified as a potential CERCLA site in the NASA Preliminary Assessment and Site Inspection. EPA and California Department of Health Services (DOHS) regulations require that existing known sites be remediated.

- Miscellaneous Projects Not in Excess of \$250,000 Each..... 650,000
- Leaking Underground Storage Tanks (LUST)..... 7,650,000

The following projects provide for replacing underground petroleum tanks and cleanup of sites contaminated by a leaking underground petroleum tank.

1. Remove and Replace Underground Storage Tanks, Various Locations,
Goddard Space Flight Center..... 400,000

This project is the first phase of a three year program to replace/upgrade the underground storage tanks at Greenbelt. Nine steel tanks up to 25 years old and requiring upgrade or replacement to meet EPA's tank standards are covered by this phase. Six of these tanks are located near Building 24 and one tank each at Buildings 3 and 27 and the Magnetic Test Site. Each tank will be evaluated with respect to expected life and replaced or retrofitted based on cost effectiveness. This project is needed for compliance with the new EPA Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (40 CFR 280).

2. Remove and Replace Underground Storage Tanks and Contaminated Soil,
Jet Propulsion Laboratory 900,000

This project will replace nine old steel underground fuel storage tanks with double walled tanks complete with leak detection systems, double walled piping, and corrosion protection. The project includes excavation and disposal of old tanks and contaminated soils, installation of new tanks and re-surfacing at the following tank locations: Buildings 230(3), 177(3), 277, 150, and Table Mountain. EPA regulations (40 CFR 280.4281) require that underground storage tanks be fitted with leak detection and corrosion protection systems. Due to the age of the tanks, over 20 years, each will be evaluated with respect to expected life and will either be replaced with new systems, or retrofitted to meet the regulations based on cost effectiveness. This is the final phase of the underground tank replacement program.

3. Construct Secondary Containment for Fuel Oil System, Kennedy Space Center..... 320,000

The Utility Annex contains three 30,000 gallon and one 10,000 gallon aboveground fuel oil storage tanks. This construction effort is required to provide secondary containment (impervious concrete slab) for prevention of soil and groundwater contamination from uncontrolled releases to the environment. Additionally, excessively contaminated soil, as defined by Chapter 17-70, Florida Administrative Code, which has been identified at the site, requires removal and incineration. Backfilling the soil removal excavation area will be required prior to containment construction.

4. Removal of Underground Storage Tanks, Various Locations, Langley Research Center..... 1,500,000

This project is required to bring five tanks at Building 1215 into compliance with EPA and State regulations. This will be accomplished by removing the existing tanks at Building 1215 and replacing them with double-walled fiberglass reinforced tanks with interstitial monitoring. EPA regulations contained in 4 CFR 280 and State of Virginia regulations VR 680-13-02 require that regulated underground storage tanks installed before December 1988 be upgraded to comply with requirements for corrosion protection, spill and overflow prevention and leak detection.

5. Replace Underground Storage Tanks, Various Locations, Lewis Research Center..... 1,500,000

This project provides for the removal, replacement, and disposal of approximately 7 underground storage tanks that are either leaking or are heavily deteriorated at Lewis and Plum Brook. The new tanks will include a leak detection system and secondary containment. This will comply with the Federal and State of Ohio underground storage tank regulations.

6. Remove and Replace Underground Storage Tanks, Various Locations,
Marshall Space Flight Center..... 680,000

This project provides for replacing and/or closing approximately eight underground storage tanks (UST). The work will consist of the following tasks for each tank: testing to determine the extent of contamination to the environment around the tank; providing temporary storage during removal of tank; excavating to remove tank and contaminated soil; dismantling of tank for disposal; disposing of tank and contaminated soil; closing of tank in-place; monitoring of environment to insure proper closure; replacing tank with approved storage tank for above-ground storage; providing proper plumbing for replacement tank; and backfilling excavated area to appropriate contours. The tanks to be replaced provide for storage of fuel for emergency generators at Buildings 4487, 4612, 4200, 4202, 4708, 4207 and 4567. The sizes and quantity of the UST's are 250 gallons (1), 275 gallons (1), 550 gallons (1), 600 gallons (2), 1000 gallons (1), 2000 gallons (1), and 3000 gallons (1). The tanks are used to store gasoline, diesel fuel, and #2 fuel oil. This project is required to be in compliance with Federal and State regulations.

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| 7. Replace Underground and Aboveground Storage Tanks, Various Locations,
Stennis Space Center..... | 550,000 |
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This project provides for the removal of five underground and four above ground storage tanks, removal of all petroleum-and pesticide-contaminated soil in the area of the tanks, the disposal of the old tanks and the replacement of the five underground tanks and two of the aboveground tanks. Three of the underground tanks located at the Repair and Fabrication Shop (Building 2201) and one at the Hydrosience Building (2101), are currently used for the storage of petroleum products. The remaining underground tank located at the Block House (Building 2501) is used to store diluted pesticide waste. The above ground tanks are currently not being used, and will not be replaced. The new tanks will have corrosion protection, leak detection for both the tanks and piping, and cathodic protection monitoring capabilities. Berms will be provided around all above ground storage tanks. Federal requirements specify that all existing underground storage tanks be replaced by 1998.

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| 8. Remediation of Groundwater and Soil Contamination, Wallops Flight Facility..... | 1,800,000 |
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This project provides for the remediation of groundwater and soil contamination at the old Aviation Fuel Farm at Wallops Flight Facility Main Base. An ongoing investigation has confirmed the presence of petroleum byproducts in the soil and groundwater with a plume extending in the direction of the City of Chincoteague water supply wells. EPA and State of Virginia regulations require that corrective action be taken.

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| Storage Facilities..... | 1,000,000 |
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The following projects provide for construction or modification of facilities to hold hazardous material in secondary containment while awaiting consumption or appropriate disposal.

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| 1. Provide Secondary Containment for Hazardous Storage Facility, Ames Research Center..... | 360,000 |
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This project provides for the construction of facilities to hold hazardous material in secondary containment. The project will involve emplacement of storage facilities at four sites within the Ames Research Center's Moffett Field site. Applicable state and local laws require secondary containment for hazardous substances stored at Ames-Moffett. Spills from existing storage and dispensing areas have caused contamination of the storm drain channels, adjoining lands, and the storm water retention pond. Ames has received notices of violation from the Santa Clara County Health Department Toxics Control Unit.

2. Construct Chemical Storage Facility, Johnson Space Center, Downey **480,000**

This project provides for the construction of a pre-engineered 8,000square foot metal building for the storage of Orbiter production chemicals used at the NASA Industrial Plant, Downey, CA. The building will have electrical power and lighting, air conditioning, humidity control and mechanical ventilation where required, fire detection and suppression system, and secondary containment for chemicals. This project consolidates hazardous manufacturing chemicals presently stored at many different locations on the Downey site. Many of the present storage locations do not meet Environmental Protection Agency (EPA) safety standards nor manufacturers suggested storage recommendations. This project will provide a safe, central location that is designed specifically to house hazardous chemicals while allowing NASA to meet applicable chemical storage regulations.

Studies, Assessments, Design and Related Engineering..... **160,000**

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - Site Studies.. **3,600,000**

Provides for site inspections, remedial investigations, feasibility studies, and remedial designs.

Clean Air Act (CAA)..... **750,000**

The following projects and related engineering provide for actions required to comply with the Clean Air Act.

1. Install Nitrogen Oxide Controls on Boilers, Johnson Space Center, Downey..... **430,000**

This project provides for the installation of nitrogen oxide controls on three boilers located next to Building **244** used for steam production, one boiler which is located in Building **239** used for heating and airconditioning, and two boilers located in Building **6** used for steam production. The project will include disconnection and reconnection of the boiler lines, removal of the existing burners, and the installation of new oxygen trimmers or low nitrogen oxide burners and controls. This project also will include testing of the new control systems. The South Coast Air Quality Management District's Rule **1146** controls the level of allowable nitrogen oxide emissions from industrial boilers. This project is necessary to bring these boilers into compliance with Rule **1146** which requires that corrections be in place by March **1, 1992**.

Studies, Assessments, Design, and Related Engineering	320,000
Clean Water Act (CWA)..	<u>4,010,000</u>

The following projects and related engineering provide for actions required to comply with the Clean Water Act requirements.

1. Provide Storm Drain Catch Basins, Jet Propulsion Laboratory 680,000

This project provides for the construction and incorporation of seven hazardous waste catch basins into the existing JPL storm drainage system. Storm drainage outlets discharge directly to the Arroyo Seco Basin, which is one area source of drinking water for the City of Pasadena. The construction of the catch basins will enable JPL to prevent the discharge of toxic and hazardous materials into the Arroyo Seco in the event of a spill on JPL grounds. When activated, the catch basin system will collect and contain contaminated run-off and washdown until a hazardous waste cleanup contractor can be brought on site to remove the contaminated material. Each catch basin will consist of a 5,000 US gal capacity pre-cast concrete box, fitted with a remotely actuated motorized gate valve. Storm drain piping down stream of the catch basins will require placement to maintain gradient. With the completion of the catch basin system, JPL can contain and treat or remove the hazardous materials before they are discharged offsite. This will result in decreased liability due to harm to human health, and significantly reduce the likelihood that JPL will be required to pay compensation to an offsite property owner for damages.

2. Remediation of Storm Sewers, Langley Research Center..... 500,000

This project provides for the cleanup of sediments contaminated with polychlorinated biphenyls (PCB's) and polychlorinated terphenyls (PCT's), replacement of oily water separator and installation of tide gates for two storm sewers. The sediments were apparently contaminated from PCB/PCT containing hydraulic oils leaking from two wind tunnels. As a result, Langley was found in violation of its National Pollution Discharge Elimination System Permit under the Clean Water Act and the Toxic Substance Control Act. A Federal Facilities Compliance Agreement was signed on December 31, 1990, to address these violations. This project is required by this Agreement.

3. Replace Oil Water Separator Systems, Various Locations, Lewis Research Center..... 780,000

This project provides for modifications to the oil/water separator system in the LeRC Industrial Waste System (IWS). This includes: modificatian to existing 1,000,000 gallon retention basins; provisions for oil, grease and sludge removal; and modifications to the existing storm, sanitary, and industrial waste sewers to ensure that contaminated waters flow into the IWS basins. Repeated failures of the existing system have resulted in violations of the EPA National Pollutant Discharge Elimination System Permit at LeRC for discharges into the Rocky River. A non-compliance order has been issued by the State of Ohio EPA requiring immediate corrective action.

4. Construct Central Industrial Wastewater Treatment Facility, Marshall Space Flight Center.....	1,045,000
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This project will provide for additional treatment processes at the central wastewater treatment plant that will handle the dilute industrial wastewater streams now being discharged to the industrial sewer without treatment. The existing Wastewater Treatment Facility can only handle concentrated metal finishing wastewaters. The new treatment processes will treat all of the current dilute wastewater streams from the metal plating/finishing operations which is required under the National Pollution Discharge Elimination System (NPDES) Permit.

Miscellaneous Projects Not in Excess of \$250,000 Each....	210,000
Studies, Assessments, and Designs	795,000
Toxic Substance Control Act (TOSCA).....	<u>200,000</u>
The following provides for compliance with the Toxic Substance Control Act.	
Studies, Assessments, Design and Related Engineering.....	<u>200,000</u>
Total.....	<u><u>\$36,000,000</u></u>

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Approximately \$40,000,000 - \$50,000,000 per year is the current rough estimate for continuing Environmental Compliance requirements.

Budget estimates

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